PARKER RIVER WATERSHED

Year 3
Watershed Assessment Report

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Dear Friends of the Parker River Watershed:

I am pleased to present the Year 3 Assessment Report for the Parker River Watershed. This report outlines the main environmental issues that face the watershed and provides the most current status of the Parker River. This report will help formulate the 5-year watershed action plan that will guide state and local environmental actions within the Parker River Watershed. This Plan will implement the goals of the Massachusetts Watershed Initiative including: improving water quality; restoring natural flows to rivers; protecting and restoring biodiversity and habitats; improving public access and balanced resource use; improving local capacity; and promoting a shared responsibility for watershed protection and management.

The EOEA Parker River Watershed Team Leader has developed this Assessment Report after extensive research and input was provided by state and federal agencies, Regional Planning Agencies, watershed groups and organizations, and team members. The Watershed Initiative is unique because it focuses on the problems and challenges that are identified with stakeholders and local community partners in each watershed, rather than deciding these priorities solely at the state level. The priority issues identified in the Report include:

- Water Quality
- Water Quantity
- Water Needs Forecast
- Habitat and Open Space

I commend all of those involved with the Parker River Assessment effort. Thank you for your dedication, perseverance, and commitment to help develop the Assessment Report. The watershed team approach is the best way for government and community partners to make significant progress in addressing the environmental challenges of the 21st century. If you are not currently involved, I strongly encourage you to contact Richard Tomczyk, the Parker River Watershed Team Leader, at (978) 661-7817, and become active in the Parker River Watershed restoration and protection efforts.

Very truly yours,

Bob Durand

Bob Durand

Table of Contents

Tables

List of Figures

I. INTRODUCTION

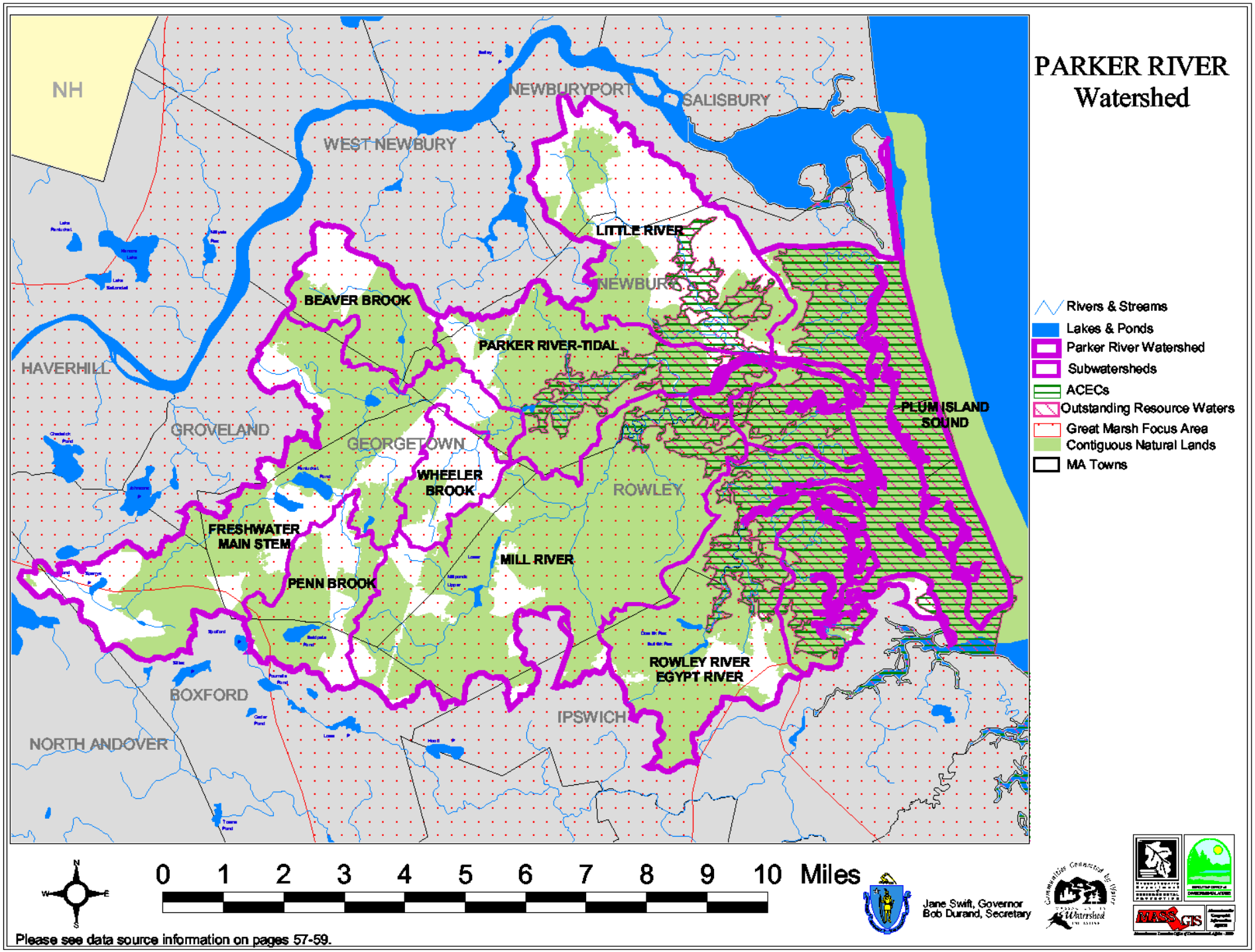
This report presents the information provided by a number of organizations, agencies and partners that share an interest in the Parker River watershed. The report provides information on the environmental conditions of the watershed. It is written as part of the five year watershed cycle under the Massachusetts Watershed Initiative and will be a useful source of information for the citizens of the watershed as well as for municipalities, government agencies, private non-profit organizations, schools and research institutions. Information contained here will be used, with the assistance of community input and watershed partners, to develop a watershed action plan. Organizations that share an interest in the Parker River watershed include the nine communities of the watershed (North Andover, Boxford, Groveland, Georgetown, Rowley, West Newbury, Newburyport, Newbury, and Ipswich) the Parker River Clean Water Association, Essex County Sportsmen's Association, Massachusetts Audubon Society, Essex County Greenbelt Association, Merrimack Valley Planning Commission, 8 Towns and the Bay, the Executive Office of Environmental Affairs - Massachusetts Watershed Initiative, Massachusetts Coastal Zone Management, Department of Food and Agriculture, Department of Environmental Protection, Department of Environmental Management, Department of Fisheries, Wildlife and Environmental Law Enforcement, United States Fish and Wildlife Service, United States Environmental Protection Agency, United States Natural Resources Conservation Service, business interests and all the people that live work and play in the watershed.

II. DESCRIPTION OF THE WATERSHED

The Parker River watershed is a coastal river watershed, bordered by the Merrimack River watershed to the north and the Ipswich River watershed to the south. The 82 square mile drainage area includes most or part of the nine communities mentioned above. There are approximately 36,300 people living in the watershed. The population is an estimate based upon the 1999 census reported for each community and its percentage of land area in the watershed. The main channel of the Parker River is formed by the confluence of two unnamed streams in West Boxford and comprises the headwaters of the Parker River. The river then descends approximately 21.3 miles through a rolling landscape to form its mouth at Plum Island Sound.

Community and Watershed Profile

Community	Percent of Community in Watershed	Total Land Area In Watershed (square miles)	Total Population	Estimated Watershed Population
Georgetown	99.8%	12.9	7,384	7,369
Rowley	94.9%	17.7	5,343	5,071
Newbury	88.8%	21.6	6.168	5,477
Newburyport	45.8%	3.8	16,808	7,698
Ipswich	38.6%	12.6	12,656	4,885
Groveland	38.5%	3.4	5,841	2,249
West Newbury	26.6%	3.6	4,021	1,069
Boxford	24.6%	5.9	9,041	2,223
North Andover	0.8%	0.2	25,065	201
Totals		82.0	92,327	36,242



Please see data source information on pages 57-59.

Figure 1

The United States Geological Survey (USGS) maintains a stream gage in the Byfield section of Newbury, just west of Route 95. This stream gage measures flow from a 21.3 square mile drainage area and has been recording stream flow since October 1945. Provisional real time streamflow measurements can be found on the USGS web page (http://mass1.er.usgs.gov/rt-cgi/gen_stn_pg?station=01101000). Review of flow data from this gage is showing a trend of lower river flows in recent years, as compared to the period of record at the gage. The cause of this is uncertain and is under investigation through a Massachusetts Watershed Initiative/Department of Environmental Management project.

Major tributaries of the Parker River include the Little River, which starts in Newburyport and flows through Newbury, and the Mill River, which flows through Rowley and joins the Parker River in Newbury near the Governor Dummer Academy. Other named tributaries include Penn Brook in Boxford and Georgetown, Jackman Brook and Wheeler Brook in Georgetown, Beaver Brook in West Newbury and Bachelder Brook and Ox Pasture Brook in Rowley. Included in the Parker River watershed is the Rowley River, which empties directly into Plum Island Sound and the estuarine portion of the Parker River. Tributaries of the Rowley River include Bull Brook and Dow Brook, which meet to form the Egypt River in Ipswich.

III. ENVIRONMENTAL CONDITIONS

The health of the watershed is influenced by the consequences of existing development and is further threatened by future development. The watershed is fortunate to have many groups working to monitor conditions and to implement practices to improve the environment and quality of life in the watershed. Involvement with water quality and water quantity monitoring, growth and development issues, habitat and open space protection will help to address many problems within the watershed.

Water quality is very good in most areas although there are some problem areas (see more details in subwatershed area discussions). Analysis of data sources collected from several researchers since 1975 show little changes in water quality throughout the watershed, although there are some areas that experience low dissolved oxygen during the low flow time of the year. In addition, other areas are impacted by non-point source pollution resulting in elevated levels of bacteria and some high concentrations of certain nutrients. Low dissolved oxygen was also detected in some of the upstream sections of Plum Island Sound (Massachusetts Audubon Society Minibays study, 2000 and DEP 1989 study). A study of a number of Massachusetts Bays embayments conduced in 1996 indicates that the Parker River and Plum Island Sound may be at risk from eutrophication (Menzie-Cura & Associates). More recent work by the Marine Biological Laboratory shows confirms this area can experience eutrophication if development is not properly controlled. Without proper control of pollution sources the upper estuary of the Parker River will be subject to nutrient enrichment possibly resulting in algae blooms due to low tidal exchange.

Water Quality

The Department of Environmental Protection has specified particular designated uses for the surface waters within the Parker River watershed, which are identified in the Massachusetts Surface Water Quality Standards[1]. These designated uses may not be currently achieved in some

[1] Additional information on the designated uses, the classification system and standards used to establish a designation can be found in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00, 1996.

segments due to one or more water quality parameters, although they are potentially achievable. All freshwaters in the watershed have been designated as Class B, except for Bull Brook reservoir and Dow Brook reservoir, which are Class A. All marine waters are designated Class SA. Class A waters are sources for public drinking water supply, are excellent habitat for fish and other aquatic life and wildlife and are suitable for primary and secondary contact recreation; Class B waters are designated as habitat for fish, other aquatic life and wildlife and for primary and secondary contact recreation. Class SA waters are marine waters which are excellent habitat for fish, other aquatic life and wildlife and for primary and secondary contact recreation. In addition, the Department of Environmental Protection has further classified the tidal portion of the Parker River and Mill River, and tributaries thereto as open shellfishing waters. This additional classification imparts more stringent regulation and protection to the waters. However since not all pollution sources have yet to be controlled, some of the shellfish beds may not be currently open to shellfishing.

Some water bodies and stream segments have been identified by the Department of Environmental Protection to be impaired due to specific parameters. Monitoring of water quality by the Department of Environmental Protection has shown that these impaired water bodies do not meet the specific criteria under the state's surface water quality standards. The most recent list of the impaired waters is shown in the table below. Information on this table may change as a result of monitoring that was completed in the summer of 1999 by the Department of Environmental Protection. In addition, waters may be added or removed from the list as a result of controlling sources of pollution and with additional monitoring data.

Treatment of wastewater in the watershed is primarily through on-site disposal practices as the only area with conventional wastewater treatment and sewers is located in the Little River subwatershed portion of Newburyport. These systems include cesspools, tight tanks, Title 5 systems and groundwater disposal treatment systems. The level of treatment from these systems depends upon the type of system, location, soils, age, and maintenance. In some areas of the watershed these systems contribute to significant amounts of bacteria to the groundwater and surface waters. Proper design, siting, construction and maintenance of these systems are necessary to maintain and achieve good water quality in the wetlands, lakes, ponds, rivers and streams of the watershed.

There are two permitted wastewater discharges in the watershed. The Governor Dummer Academy wastewater treatment facility, which discharges treated wastewater at Mill River, has recently been addressed through a major upgrade and operational improvement. This will yield direct benefits to the water quality of Mill River and Parker River. The Triton Regional School wastewater treatment facility, which discharges treated wastewater to leaching fields, also was recently upgraded.

There are ten other permitted discharges to surface waters in the Parker River watershed. These are covered under the Environmental Protection Agency's National Pollution Discharge Elimination System (NPDES) permits. The majority of these permits in this watershed relate to stormwater or construction dewatering permits. However, there are some that relate to the discharge of treated sanitary wastes. A list of these permits is included in the appendix after the subwatershed descriptions at the end of this report.

Impaired Waters in the Parker River Watershed[2]

[2] See DEP FINAL Massachusetts Section 303(d) List of Waters, 1998 for additional information.

Water Body	Location	Reason For Impairment
Baldpate Pond	Boxford/Georgetown	Noxious Aquatic Plants
Sperry's Pond	Boxford	Noxious Aquatic Plants
Crane Pond	Groveland	Noxious Aquatic Plants
State Street Pond	Newburyport	Noxious Aquatic Plants
Central Street Pond	Rowley	Noxious Aquatic Plants
Lower Mill Pond	Rowley	Noxious Aquatic Plants
Upper Mill Pond	Rowley	Noxious Aquatic Plants
Wilson Pond	Rowley	Noxious Aquatic Plants
Eagle Hill River	Headwaters near Town Farm Road, Ipswich, to mouth at Plum Island Sound	Pathogens
Plum Island Sound	Includes Ipswich Bay	Pathogens
Paine Creek	Headwaters to Eagle Hill River	Pathogens
Rowley River	Confluence with Egypt River and Muddy Run to mouth at Plum Island Sound	Pathogens
Parker River	Central Street to mouth at Plum Island Sound	Pathogens
Parker River	Source in Boxford to Central Street in Newbury	Flow Alteration (needs confirmation)

There are also a number of hazardous waste sites in the watershed. The clean up and containment of these sites are being managed by the Department of Environmental Protection. Several sites have been addressed and some sites are in the process of being handled. A list of the sites and their current status are included in the Appendix.

Water Quantity

Water quantity and flow in the Parker River is becoming a concern. In some years sections of the river, primarily in Georgetown, and some tributaries have gone dry in certain areas. This may be due to one or more of the following factors: water supply demands, flow alteration or increased amounts of paved surfaces. Some have suspected that beaver dams have altered the flow of the river to such a degree as to affect downstream flow. Others suspect that a change in land use from agricultural to primarily forest has changed the water budget of the river. Based upon a review of stream gage data it appears that the Parker River watershed has been classified as being stressed due to low flow conditions (DEM, Stressed Basin Report, 2001). Flow statistics from the USGS stream gage in Byfield indicate that river flow during the low flow time of the year has been decreasing in the last decade, in comparison to the long-term stream gage record from the same site.

Many of the watershed communities rely on the water resources of the Parker River watershed for their drinking water supply. In most cases this is supplied from wells, either private residential wells, or public groundwater wells. Reservoirs, located both within and outside the Parker River watershed also provides water for residential and commercial use. The following table identifies the type and source of water supply for each of the Parker River watershed communities. The status of water supply protection plans for these sources is also included.

Drinking Water Supplies for Parker River Watershed Communities[3]

Community	Source	Watershed	Status of Water Supply Protection
North Andover	Lake Cochichewick	Merrimack River	Watershed Protection Approved by DEP
Boxford	Private wells and small system private wells	Parker River, Ipswich River, Merrimack River	Wellhead Protection Approved by DEP
Groveland	Public wells and private wells	Merrimack River	Wellhead Protection Approved by DEP
Georgetown	Public wells and private wells	Parker River	Wellhead Protection Approved by DEP
West Newbury	Public wells, private wells and Newburyport surface water supply	Merrimack River and Parker River	Wellhead Protection Approved by DEP
Newbury (Byfield)	Public wells, private wells and Newburyport surface water supply	Parker River and Merrimack River	Wellhead Protection Approved by DEP
Newburyport	Surface water supply and public wells	Merrimack River	Watershed Protection Approved by DEP
Rowley	Public wells and private wells	Parker River	Local Bylaw adopted
Ipswich	Surface water supply, public wells, private wells	Parker River, Ipswich River	Watershed and Wellhead Protection Approved by DEP; Local Bylaw adopted

In addition to these sources there are other demands on the Parker River water resources. Examples of these include lawn and golf course irrigation, agricultural use, restaurants, hospitals, schools, fire protection and recreational facilities. While the quality of water in the watershed is generally very good, there are growing concerns related to potential threats from pollution as well as anticipated water needs and quantity. This will be one of the major issues facing the watershed in future years.

The total 1981-85 registered volume for the Parker River watershed is 1.79 million gallons per day (mgd). Public water supply system customers are the primary water supply users in the basin. Water use between 1990 and 1994 (base demand) averaged 2.43 mgd for the four basin communities. Water use increased 0.64 mgd or 36% from the 1981-85 registration volume to the base demand period. Note that these statistics do not include water from sources that use less than 100,000 gallons per day.

Water Needs Forecast

The methodology for projecting water demand for each community uses a disaggregated approach, based on the 1990-94 water use for each community in the study area. The methodology requires a breakdown of residential, non-residential and unaccounted-for water. Based on the water needs

[3] In addition to the public water systems in these communities there are also private wells that service homes and other uses as well as Transient Non-Community and Non-Transient Non-Community systems.

forecast methodology, the 2015 forecast for the study area water suppliers is 2.68 mgd. This is a projected increase of 0.25 mgd or 10.2% from the 1990-94 base water use of 2.43 mgd.

Consideration of the site specific, local impacts associated with groundwater withdrawals is based on pumping tests and other hydrogeologic information which will be used to predict water table drawdown in the immediate vicinity of the withdrawal. The potential for negative impacts to wetlands, streams, ponds, species habitat or other wells will be considered prior to issuing a permit. In most cases, there are not site specific criteria available to determine what would constitute an unacceptable impact. However, if unanticipated impacts are found to result from the permitted withdrawals over time, the Department of Environmental Protection has the authority to impose conditions in the withdrawal permits. The Department of Environmental Protection consults with other state agencies to evaluate the impacts of any proposed withdrawals before permit issuance. No analysis has been conducted on the safe yield of the Parker River watershed or any of its subwatersheds relative to water supply withdrawals for the interests of the state's Water Management Act. This has great implications on the health of these water bodies, as it is impossible to identify impacts to the river without determining the safe water supply yield. The lack of a safe yield determination for the watershed will also have consequences on future water needs for each of the communities and the water needs of the entire watershed.

As an example, it has been suggested that the Georgetown wells may be responsible for contributing to the low flow conditions occurring on the Parker River. In some of the recent summers the reach of the river between the Georgetown wells and Rock Pond has had little or no flow. It is not known if this is due to geologic conditions surrounding this section of the river, over pumping of the wells or a combination of both factors. As part of the permitting for the use of these wells the town must monitor the surrounding wetlands on a regular basis to see if the well use is having an impact. DEP will be reviewing the results of this monitoring. However, other factors may be contributing to these low flow events – land use change, impervious area, stormwater management and beaver activity may be acting to affect flow of the river.

All withdrawal permits include the condition that specific measures be implemented to ensure careful use of the resource. The requirements for public water suppliers are based on standards approved by the Massachusetts Water Resources Commission. These standards include meter repair and replacement, regular leak detection surveys and the development and implementation of a water conservation and education program. The watershed team is working with the local communities to develop water conservation and education programs. The Department of Environmental Protection also encourages communities to adopt a Water Use Restriction Bylaw, which will allow the community to impose outdoor water use restrictions.

Habitat and Open Space

Habitat and open space is being addressed both at a regional level and by local efforts in each of the communities in the watershed. Open space and recreation committees in the local communities are working to identify ways of protecting open space for wildlife habitat, passive recreation and active recreation. Of the estimated 52,000 acres in the Parker River watershed approximately 15,000 acres – which is about 29% of the total acreage in the watershed - are in some form of permanent protection either through public ownership or with deed restrictions (conservation restriction or agriculture preservation restriction).

Much of the coastal portion of the Parker River watershed is included in the Parker River/Essex Bay Area of Critical Environmental Concern (ACEC). This ACEC is noted for extensive salt marsh, barrier beach and dune ecosystems, shellfish beds and abundant wildlife. For additional information on the significance of this area and other natural resource information please review the recently completed Parker River/Essex Bay ACEC Resource Inventory available from the Massachusetts Coastal Zone Management Office and the Department of Environmental Management ACEC Program.

Nearly the entire Parker River watershed is included within the Great Marsh Open Space Focus Area. This focus area covers approximately 154,900 acres within and beyond the Parker River watershed. It contains all of the Parker River/Essex Bay ACEC and extends into much of the watershed. Besides the Parker River/Essex Bay ACEC this focus area is characterized by several state parks and forests. The Department of Environmental Management manages six properties within the watershed –Georgetown Rowley State Forest (1,150 acre), Rowley State Forest (10 acres), Prospect Hill Recreation Area (90 acres), Baldpate Pond State Park (77 acres), a portion of the Willowdale State Forest (800 acres, 1200 additional acres are in the Ipswich River watershed) and Sandy Point State Reservation (73 acres). In addition, the Parker River Wildlife Refuge, owned and operated by the U. S. Fish and Wildlife Service, helps to shape this focus area. The designation of the Great Marsh Focus Area, by the Executive Office of Environmental Affairs, will help to foster innovative land conservation practices, promote partnerships, and show measurable progress in achieving land protection on a regional scale. With partnerships of private land trusts, private landowners, municipalities and state and federal agencies it is hoped that the amount of permanently protected open space will be increased.

The freshwater portion of the Parker River and many local ponds are stocked with trout and other non-native and native fish species can be found in these water bodies. While these fish provide enjoyable sporting opportunities some of the water bodies have fish advisories due to the levels of certain contaminants found in the tissues of some fish species (see “Areas of Concern”, below).

The Parker River Clean Water Association has organized an alewife fish count in each of the last four years. As in previous years the Essex County Sportsmen’s Association – the official stewards of the Parker River fishways – have lent their support in maintaining the fishways. The alewife count has fluctuated over the four years, from an estimate of 4242 fish in 1998 to 7965 fish in 1999. In comparison, data from the 1970s as part of research by students from the University of Massachusetts yielded alewife numbers ranging from 6600 fish to 38,000 fish during the annual migration. While the cause for the decline of the alewife estimates is unclear, it may serve as an important indicator of the watershed’s overall health.

The shellfish resource in the Parker River watershed is important for a number of reasons. It is a part of a large coastal ecosystem, filling an important niche in terms of filtering water and being part of the food chain. In addition, it is a valuable resource for recreational and commercial harvesters. However, pollution affects the ability of this resource to be fully realized. This pollution comes from a number of sources, including, failed septic systems, boat waste, unlined landfills, contaminated stormwater, domestic animal waste and feral animal waste. While not necessarily affecting the health of the shellfish, the bacteria can accumulate within the shellfish resulting in toxic levels when consumed by humans. For this reason many shellfish beds have been closed to harvest.

Information is available on the status of the shellfish resource in the Parker River/Essex Bay ACEC Resource Inventory. The following is a quote from this document – "Although the soft-shell clam is still the most important economic fishery and supports a community of harvesters, distributors, processors, and restaurant owners in the Area of Critical Environmental Concern (ACEC) region, pollution continues to hurt the modern shellfish industry. In Massachusetts, the Division of Marine Fisheries has responsibility for monitoring waters above shellfish beds for fecal coliform bacteria to determine whether shellfish are safe to eat. The Division of Marine Fisheries samples and classifies shellfish harvesting areas according to requirements of the National Shellfish Sanitation Program (NSSP) guidelines. The Division of Marine Fisheries conducts sanitary surveys at a minimum of once every 12 years to determine sources of pollution in waters overlying shellfish beds. The survey and report are updated and kept current through annual and triennial evaluations, which continually assess water quality for classification purposes. Field observations by technically trained persons who reliably evaluate pollution sources and associated impacts on growing areas are another critical component of the survey and reevaluation process."

Based upon these evaluations the Division of Marine Fisheries has classified most of the waters in the Plum Island Sound Area of the Parker River watershed are "Conditionally Approved" for shellfishing. This means that the shellfish beds may be open for harvest except during certain rainfall events. Some areas, primarily in the Little River and Mill River subdrainage areas and the upper tidal portions of the Parker River have been classified as Prohibited. These areas are closed due to elevated levels of fecal coliform making the shellfish unsuitable for human consumption. The tidal portions of the watershed including Plum Island Sound abound with shellfish such as soft-shelled clams, surf clams and blue mussels. A recreational oyster resource exists in sections of the Little River and the Parker River and is potentially available, contingent upon the elimination of non-point source pollution. Many species of finfish inhabit the coastal waters, including herring, menhaden, striped bass, bluefish, and flounder.

IV. AREAS OF CONCERN

Without question the primary area of concern in the Parker River watershed is the added demands and pressures from future development. While much of the watershed is undeveloped, the potential for additional development is great since much of the undeveloped lands are unprotected. With future development comes an added demand on natural resources and water supply. In addition, development results in habitat fragmentation, increased impervious area, more stormwater runoff, and poorer water quality. Ways to address these concerns involve planning at the local level and watershed level by implementing management measures such as stormwater controls. Tools available to local communities include planning services for community development plans – available through the Executive Office of Environmental Affairs Community Preservation Initiative and Executive Order 418 – as well as utilization of innovative subdivisions designs such as the Green Neighborhoods development concept.

Related to this concern is the lack of a comprehensive analysis of the water supply needs and safe yield for those needs. Without this comprehensive analysis and safe yield determination it will be impossible to evaluate the ability of the watershed to sustain future growth or to determine the impact on water resources and the competing uses of those water resources.

Non-point source pollution continues to be a concern in many areas of the watershed. This includes failing septic systems – which are known to impact several ponds and rivers (see list of

impaired waters as an example) – stormwater runoff, agricultural runoff and other discreet sources. Removal of natural vegetative buffers along water bodies also adds to the problem.

Non-point source pollution in the Little River subwatershed continues to impair conditions in the Little River and affect water quality in the Parker River. A recently released study by the Merrimack Valley Planning Commission identifies several recommendations that should help to improve conditions in the Little River.

In 1997 the Parker River Clean Water Association conducted a shoreline survey in several segments of the watershed. Some of the problems identified in the survey include: road runoff and stormwater management, alteration of riparian habitat, modifications by beaver activity, and invasive plants. Additional information from this survey is included in the subwatershed descriptions.

The Newburyport landfill at Crow Lane is an inactive unlined landfill. While no data currently exists that point to this landfill as a threat to the water quality of the Little River, it is recommended that an assessment of conditions at the landfill be conducted. Surface and ground water quality in the vicinity of the landfill should also be analyzed for pollutants other than bacteria.

The unlined Newbury landfill, located near the Little River and within the Plum Island Sound Essex Bay Area of Critical Environmental Concern has come under recent scrutiny. Management of the landfill – including its closure and capping, encroachment on the adjacent salt marsh, and concerns related to stormwater and leachate are under review by the Department of Environmental Protection.

The former Newbury Auto Body property, now currently under the control of JRM Disposal Company, should be assessed for potential threats to the Little River.

Groundwater contamination in the Pine Island section of Newbury has affected private water supplies in the area. An assessment of the causes of the contamination and control of the sources are needed.

Advisories on freshwater fish consumption have been issued for water bodies in the Parker River watershed by the Massachusetts Department of Public Health. These advisories do not include stocked fish (such as trout from Mass Wildlife fish hatcheries). Additional information on fish advisories is available at the Massachusetts Department of Public Health's website www.state.ma.us/dph/beha/fishlist.htm. The water bodies of concern in the Parker River Watershed include:

Fish Advisories

Water Body	Town(s)	Fish Advisory	Hazard
Baldpate Pond	Boxford	Children younger than 12, pregnant women, nursing mothers should not eat fish (except stocked fish); the general public should not eat any largemouth bass and the general public should limit consumption of other fish to 2 meals per month from this water body.	Mercury

Pentucket Pond	Georgetown	Children younger than 12, pregnant women, nursing mothers should not eat fish (except stocked fish); the general public should not eat any largemouth bass or black crappie and the general public should limit consumption of other fish to 2 meals per month from this water body.	Mercury
Rock Pond	Georgetown	The general public should not consume any fish (except stocked fish) from this waterbody.	Mercury

Upon reviewing the existing database for certified vernal pools in the watershed it is evident that few of the potentially certifiable vernal pools have been identified. The Watershed Team should work to highlight the importance of vernal pools, organize local efforts to certify vernal pools and participate in biodiversity events.

V. **Subwatershed Analysis**

The following sections of the report describe conditions in nine subwatersheds of the Parker River watershed. Each subwatershed description also provides GIS Maps, which identify some of the important features, found in the subwatersheds. Each subwatershed description contains the following elements.

Municipalities - The list of communities that have any portion of their corporate boundaries within the subwatershed.

Estimated Population - An estimate of the number of people living in the subwatershed. This is based upon the 2000 population as estimated by each town and subsequently proportioned based upon the area of each town in the subwatershed. Total Parker River watershed population is estimated to be 36,300.

General Description – A summary of the environmental conditions and setting of the subwatershed with information on concerns and potential action items.
Land Area - The estimated land area based upon 1999 Mass GIS mapping information.

Land Use - Based upon 1999 information, except for those portions in the town of Ipswich, which is based upon 1991 land use information. Undeveloped includes agriculture, forest, wetlands, open land, and water; Residential includes single family and multifamily of various density; commercial/industrial includes non-residential properties, waste disposal and transportation.

Named Tributaries - The named rivers, brooks and streams as they appear on USGS Topographic maps or as locally known.

Lakes and Ponds - The named lakes and ponds as they appear on USGS Topographic maps.

Rapid Watershed Assessment – An assessment of water quality and aquatic habitat based upon the percentage of land area in the subwatershed that has been converted from a natural condition to an impervious (or paved) condition. This utilizes the approach discussed in the "Rapid Watershed Planning Handbook- A Comprehensive Guide for Managing Urbanizing Watersheds, October

1998, reprinted 1999) by the Center for Watershed Protection. Generally this approach describes a waterway in a subwatershed as being a sensitive stream if it has less than 10% impervious cover and would be considered high water quality and high habitat quality. Streams in watersheds with 10% to 25% impervious cover are described as being impacted, showing some decline in water quality and habitat. Streams in watersheds with more than 25% impervious area are described as non-supporting streams and are considered highly degraded.

Water Quality Information - Provides a summary of water quality data and conditions in the watershed based upon a number of sources of information. Also provides information on current or on-going water quality monitoring in rivers, streams, lakes and ponds. Additional information is available in the Department of Environmental Protection, Parker River Watershed Water Quality Assessment.

Recommendations – A discussion of potential actions to address the various issues in the subwatershed. These will be further discussed in the watershed action plan, which will follow this watershed assessment.

Parker River Freshwater Mainstem Subwatershed Information

Municipalities: North Andover, Boxford, Georgetown, Groveland, West Newbury, Newbury.

Estimated Population: 7400

General Description: This subwatershed originates in North Andover and West Boxford and is the headwaters of the main stem of the Parker River. Six large hills – Byers, Russell, Foster, Wood, Bayn's, and Shaven Crown – are the primary geologic features that form the upper boundary of this subwatershed. Unnamed tributaries meet in West Boxford to form the Parker River. The land use is primarily residential and open space, some of which has been protected by the Georgetown Water District or through conservation restrictions. In addition, a large portion of the Crane Pond Wildlife Management Area is located within this subwatershed. Industrial/commercial areas in Georgetown are also located in this subwatershed. The public water supply areas for Georgetown and Newbury are located in this subwatershed. Georgetown Produce has a permit from the Department of Environmental Protection to withdraw water from Rock Pond. Undeveloped land use has declined from 7064 acres in 1991 to 6722 acres in 1999; residential land use has risen from 1965 acres in 1991 to 2349 acres in 1999.

Land Area: 9,320 acres (14.6 square miles)

Land Use as of 1999: Undeveloped – 6722 acres (72% of the subwatershed, Forest is 54%)
Residential – 2349 acres (25% of the subwatershed)
Commercial/Industrial – 249 acres (3% of the subwatershed)

Named Tributaries: Lufkin Brook (locally named)

Lakes and Ponds: Cole's Pond, Crane Pond, Pentucket Pond, Rock Pond, Sperry's Pond.

Rapid Watershed Assessment: The proportion of impervious cover in this subwatershed is estimated to be 4.3%, based upon 1999 land use information. This is a slight increase from the 1991 impervious area estimate of 3.8%. The water quality would be expected to be of high quality. While a comprehensive survey has not been done, one would expect to find excellent habitat, diverse communities, and a stable stream channel. However, some localized impacts from summer low flows, road runoff, non-point source pollution and habitat alteration are likely. Impacts are expected with future growth, predicted by a recently completed build-out analysis.

Water Quality Information: This section of the Parker River is listed as needing confirmation of impairment due to flow alteration. Portions or the river have been observed to go dry in recent years, but not in all years. Sperry's and Crane Pond are listed as impaired due to noxious aquatic plants. Mercury in fish in this area appears to be higher than the state average and fish consumption advisories have been issued by the Massachusetts Department of Public Health for Pentucket Pond and Rock Pond. The advisory can be found at www.state.ma.us/dph/beha/fishlist.htm

The invasive aquatic plant fanwort, *Cabomba caroliniana* was found in Pentucket Pond in 1997. The town of Georgetown has taken steps to control its spread. With funding from several state agencies, Georgetown, through its consultant the Merrimack Valley Planning Commission, is

investigating the causes of high coliform bacteria at the town beach. The Merrimack Valley Planning Commission will also be conducting a watershed assessment for Rock and Pentucket Ponds from funds secured through the Massachusetts Watershed Initiative. Stormwater management practices are being implemented by the town to address some of the suspected sources of the bacterial contamination at Pentucket Pond. Through the efforts of the Department of Environmental Protection, the Georgetown Housing Authority has recently upgraded and improved the wastewater management system at the Trestle Way property. This should result in improved water quality conditions in Pentucket Pond.

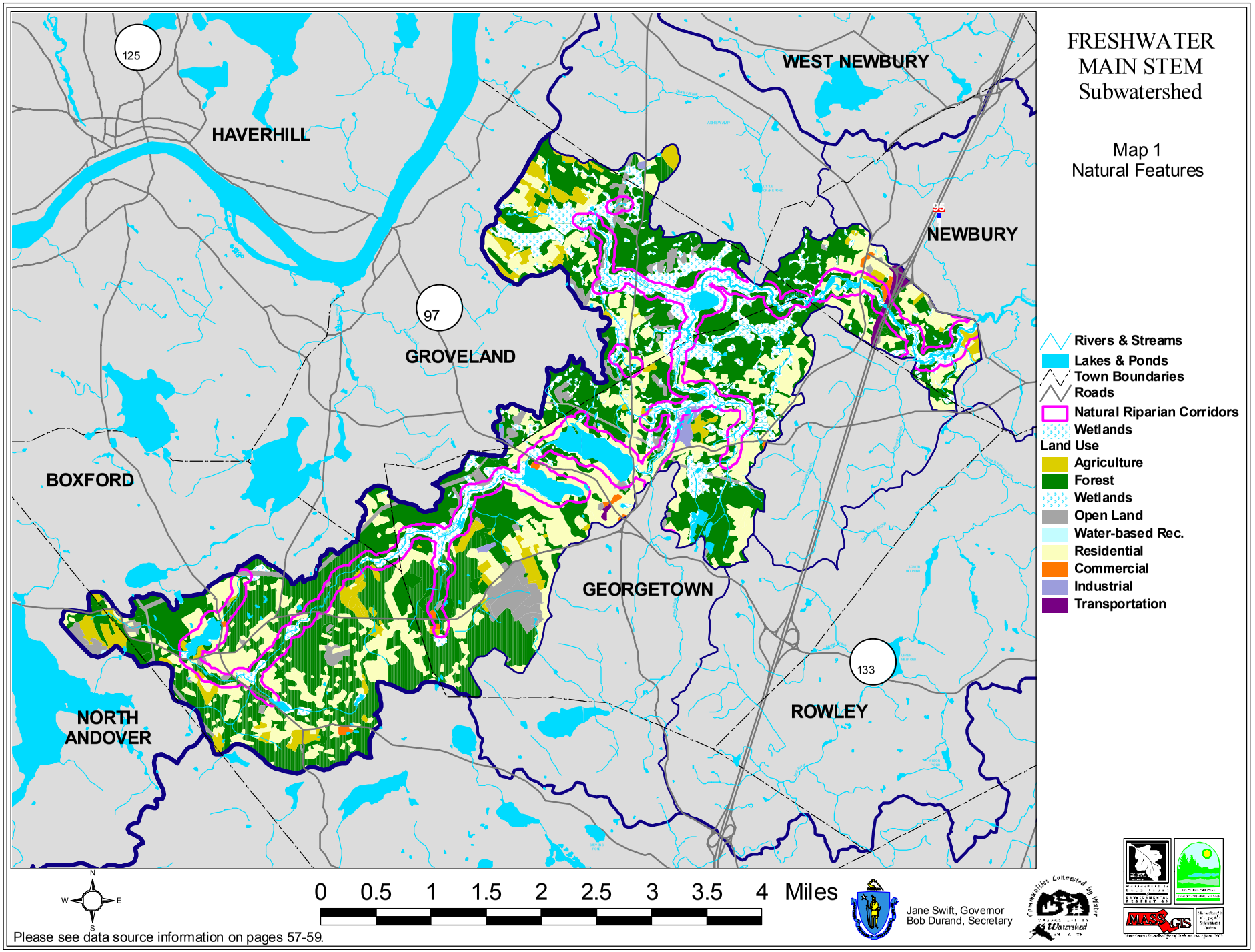
The Parker River Clean Water Association has conducted volunteer monitoring at six locations in this subwatershed. The Department of Environmental Protection, Division of Watershed Management had conducted water quality monitoring at several sites in 1975, 1978, 1984 and 1994. In 1999 biomonitoring replaced the DEP water quality monitoring program. Monitoring has shown that instream nitrogen and phosphorous concentrations are lower than many other Massachusetts rivers. Dissolved oxygen can be depressed during the summer low flow period. The Parker River Clean Water Association conducts a fish count at several sites in this subwatershed during the spring alewife run.

The Massachusetts Department of Environmental Management conducted a pond assessment in Pentucket Pond in 1997; results for the parameters tested fell within the normal range for a healthy lake, however aquatic plant growth is dense in some areas of the pond.

Wildlife and Fisheries: The Parker River, Rock Pond and Pentucket Pond are stocked with trout and the river is managed for anadromous fish (alewife). Several sites of Natural Heritage & Endangered Species Priority Site and Rare Habitat are located within this subwatershed. Blanding's turtle have been found in this subwatershed. A tracking study is being conducted to identify habitat of this Threatened species in the Boxford and Groveland area.

Land Protection: Groveland and Georgetown have begun investigating ways of protecting land along the Parker River and bordering areas in the Merrimack River watershed. This area includes a proposed subdivision known as Stephenson's Way. Boxford has a number of potential land protection projects in the headwaters. Another area of interest for the Georgetown Open Space Committee is an area between Pentucket Pond and Wheeler Brook.

Recommendations: Continue working with the Town of Georgetown on the Pentucket Pond, Rock Pond watershed management plan. Keep a watchful eye for fanwort in Pentucket Pond. Determine the effectiveness of the new Pentucket Pond fish ladder as well as assisting with its operation and maintenance. Continue to work with the Essex County Sportsmen's Association, Essex County Greenbelt Association and Parker River Clean Water Association, on all fish ladders in the subwatershed. Review mitigation monitoring reports for Duffy's Landing well, Georgetown. Seek to obtain aquatic habitat information of this subwatershed, possibly through a volunteer stream survey. Need to certify vernal pools. Follow the progress of the Blanding's turtle tracking study. Review draft list of impaired waterbodies and prioritize actions to correct the impairment, work to delist some segments or monitor to determine status of impairment. Conduct stream survey and aquatic habitat survey.


FRESHWATER
MAIN STEM
Subwatershed
Map 1
Natural Features
WEST NEWBURY
HAVERHILL
NEWBURY
GROVELAND
BOXFORD
GEORGETOWN
ROWLEY
NORTH
ANDOVER
125
97
133
Rivers & Streams
Lakes & Ponds
Town Boundaries
Roads
Natural Riparian Corridors
Wetlands
Land Use
Agriculture
Forest
Wetlands
Open Land
Water-based Rec.
Residential
Commercial
Industrial
Transportation
N
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0 0.5 1 1.5 2 2.5 3 3.5 4 Miles
Jane Swift, Governor
Bob Durand, Secretary
Please see data source information on pages 57-59.

Figure 2

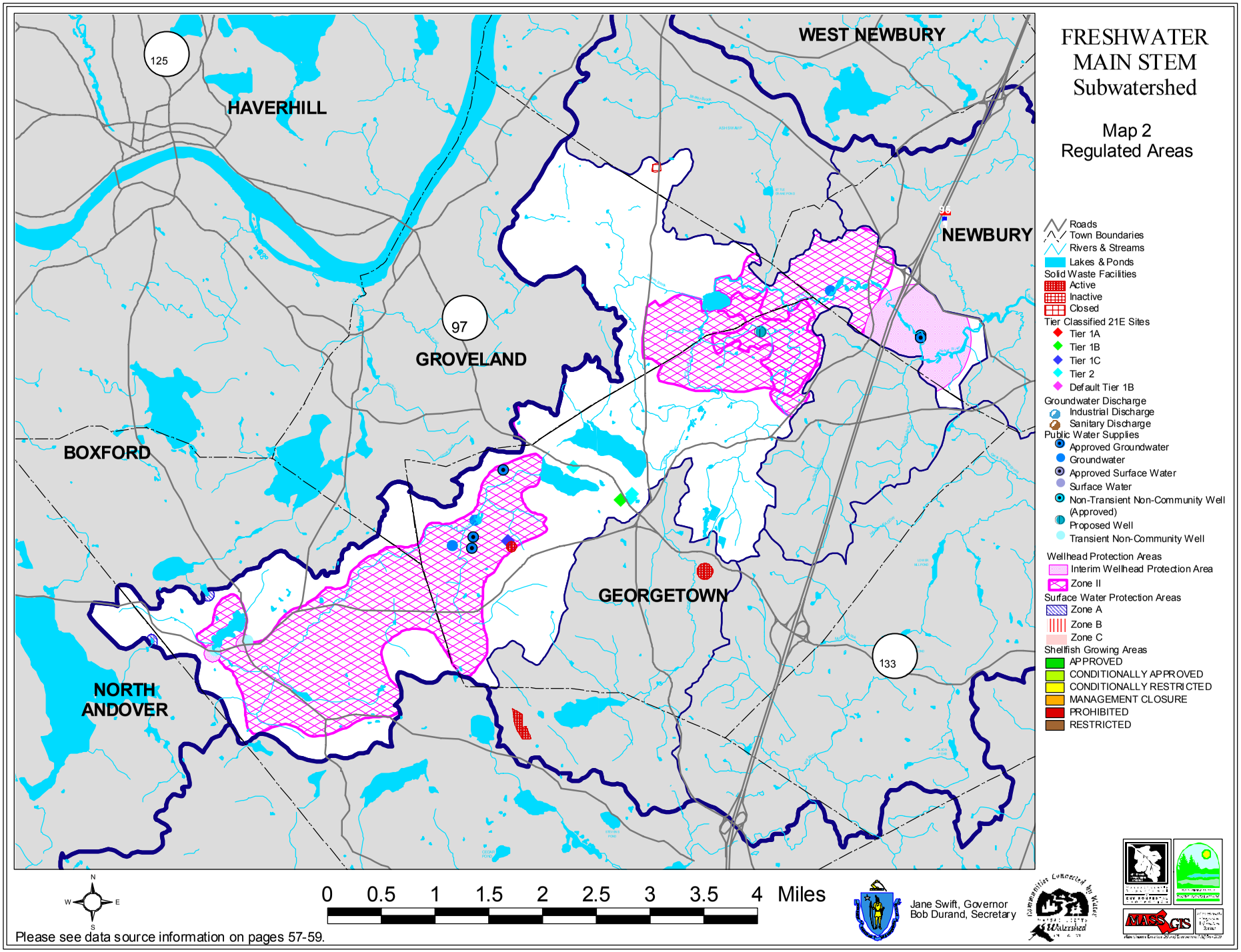

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Figure 3

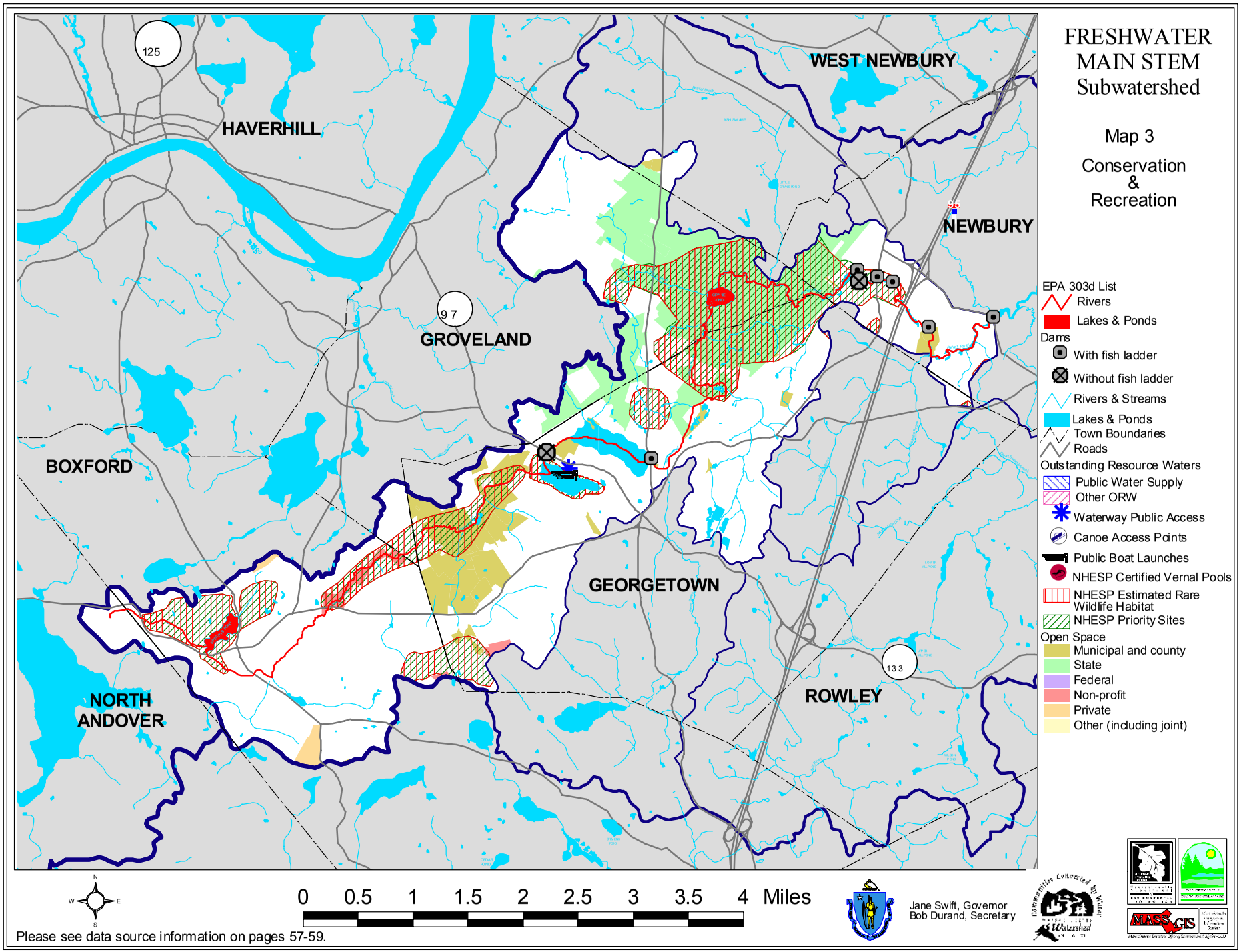

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Figure 4

Penn Brook Subwatershed Information

Municipalities: Boxford, Georgetown

Estimated Population: 2014

General Description: The Penn Brook subwatershed begins in Boxford at the watershed divide between the Parker River watershed and the Ipswich River watershed. A small stream flows behind the Spofford Pond School, around the Boxford sanitary landfill to Baldpate pond. Penn Brook then begins at the outlet of Baldpate Pond through wetland areas until it reaches Georgetown town center. It joins the Parker River downstream of Pentucket Pond. Flooding is a concern within the area of the subwatershed that is influenced by the Georgetown town center. An anadromous fish run once existed in Penn Brook with alewives spawning in Baldpate Pond. Alewives can no longer reach Baldpate Pond due to impassable culverts at Central Street (Route 97) and at a rail bed easement further upstream. Boxford State Forest and Georgetown Rowley State Forest comprise some of the protected open space in this watershed, together with a few privately held protected parcels. The Undeveloped land use category has declined from 1905 acres in 1991 to 1793 acres in 1999. Residential land use increased from 567 acres in 1991 to 793 acres in 1999.

Acres/Square Miles 2661 acres/4.2 square miles

Land Use as of 1999: Undeveloped – 1793 acres (67% of the subwatershed, Forest is 55%)
Residential – 793 acres (30% of the subwatershed)
Commercial/Industrial – 75 acres (3% of the subwatershed)

Named Tributaries: Bulford Brook

Lakes and Ponds: Little Baldpate, Baldpate Pond

Rapid Watershed Assessment: The proportion of impervious cover in this subwatershed is estimated to be 4.5%. The water quality would be expected to be of high quality. While a comprehensive survey has not been done, one would expect to find excellent habitat, diverse communities, and a stable stream channel. However, some localized impacts from summer low flows, road runoff, non-point source pollution and habitat alteration is likely. Impacts are expected with future growth, predicted by recently completed development build-out analysis.

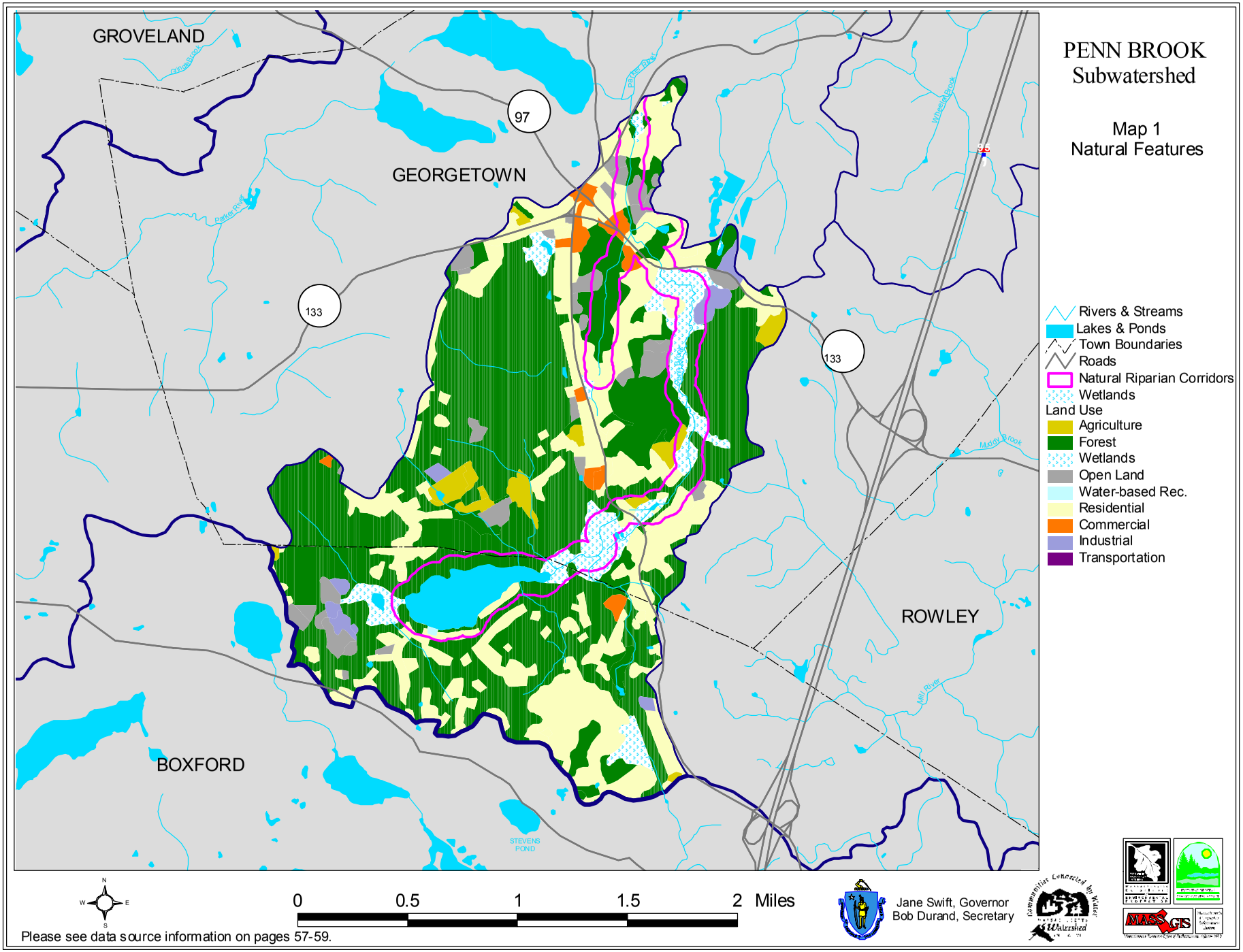
Water Quality Information: Monitoring conducted by the Department of Environmental Protection since 1975 indicates that Penn Brook is impacted by non-point source pollution. Monitoring was conducted at two stations on Bulford Brook and two stations on Penn Brook in 1978 as well as three stations on Penn Brook in 1994. Data from these stations indicate that Penn Brook suffers from low dissolved oxygen and relatively high concentrations of nutrients and fecal coliform bacteria. A biological assessment was conducted in the vicinity of Parsonage Street in the summer of 1999. This survey, conducted in a 20-meter section of Penn Brook, revealed that the aquatic habitat in this area is severely impaired from habitat disturbance, while the macroinvertebrate survey indicates an absence of gross levels of organic pollution. Therefore, erosion, sedimentation,

removal of riparian vegetation and localized sources of non-point source pollution are likely the primary causes of the habitat impairment.

The Department of Environmental Management Lakes and Ponds Program conducted a survey of Baldpate Pond in 1998. The Department of Environmental Protection did a previous survey in 1981. There have been slight changes in water quality between the surveys, however land use change (from forest to low density residential) at the southern side of the pond will likely influence the future water quality.

The Parker River Clean Water Association has a monitoring station located on Penn Brook at Georgetown High School as part of their monthly volunteer water quality monitoring program.

Recommendations: Continue to work with the Boxford Open Space Committee and Georgetown Open Space Committee to establish joint open space protection projects. Work with the Mass. Highway Department, Georgetown Highway Department and Massachusetts Electric to identify ways to eliminate obstructions to fish passage at Penn Brook. A shoreline survey and aquatic habitat survey should be conducted in this subwatershed. Outreach and volunteer efforts to address improper yard waste disposal, riparian buffer disturbance, non-point source pollution and littering of the stream is needed here. Work with local groups to establish a link between Boxford State Forest and Georgetown-Rowley State Forest, possibly by establishing a protected greenway along Penn Brook. Need to locate, inventory and certify vernal pools.


PENN BROOK
Subwatershed
Map 1
Natural Features
GROVELAND
GEORGETOWN
ROWLEY
BOXFORD
97
133
133
Rivers & Streams
Lakes & Ponds
Town Boundaries
Roads
Natural Riparian Corridors
Wetlands
Land Use
Agriculture
Forest
Wetlands
Open Land
Water-based Rec.
Residential
Commercial
Industrial
Transportation
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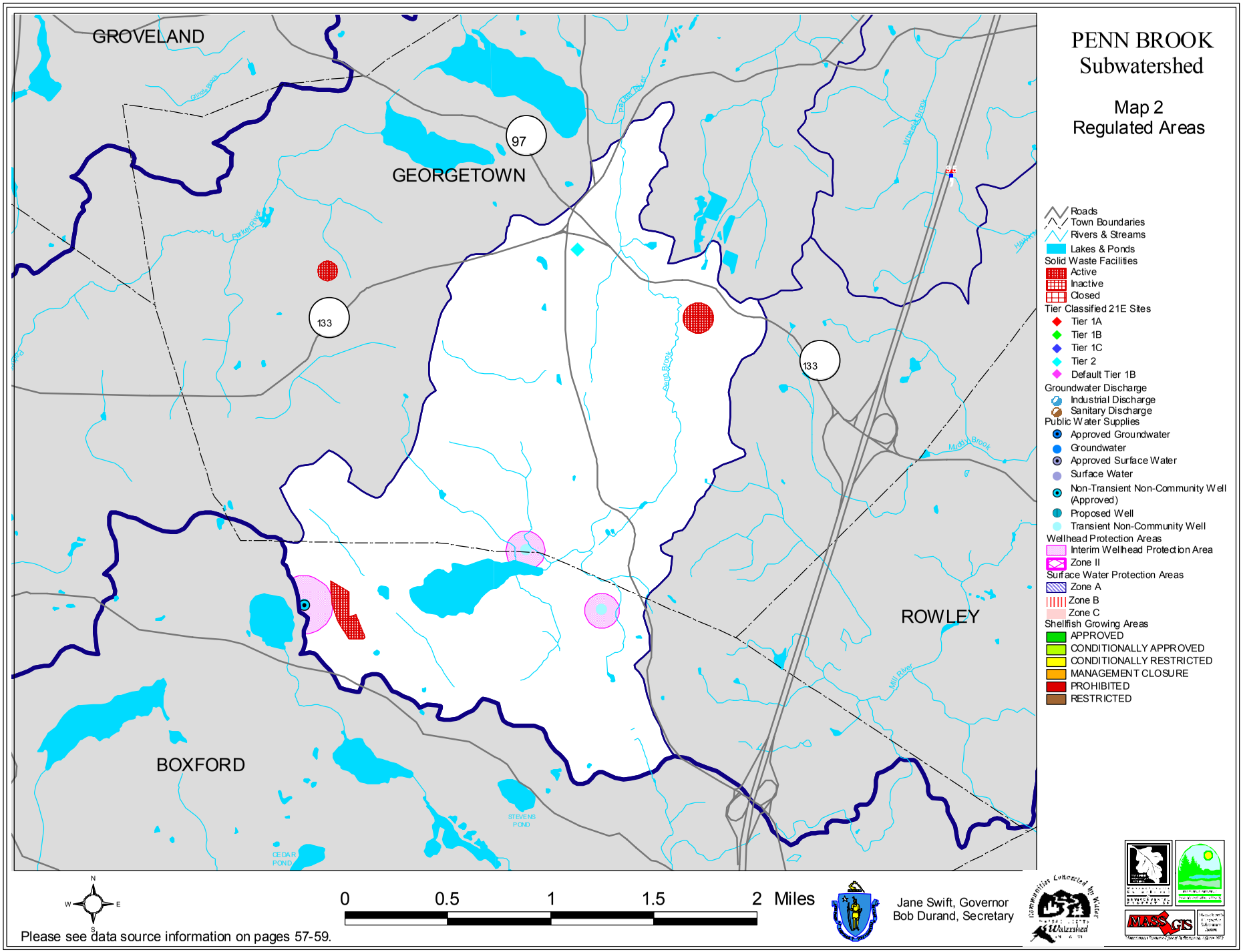
2 Miles
Jane Swift, Governor
Bob Durand, Secretary
Please see data source information on pages 57-59.

Figure 5


PENN BROOK
Subwatershed
Map 2
Regulated Areas
GROVELAND
GEORGETOWN
ROWLEY
BOXFORD
97
133
133
Roads
Town Boundaries
Rivers & Streams
Lakes & Ponds
Solid Waste Facilities
Active
Inactive
Closed
Tier Classified 21E Sites
Tier 1A
Tier 1B
Tier 1C
Tier 2
Default Tier 1B
Groundwater Discharge
Industrial Discharge
Sanitary Discharge
Public Water Supplies
Approved Groundwater
Groundwater
Approved Surface Water
Surface Water
Non-Transient Non-Community Well (Approved)
Proposed Well
Transient Non-Community Well
Wellhead Protection Areas
Interim Wellhead Protection Area
Zone II
Surface Water Protection Areas
Zone A
Zone B
Zone C
Shellfish Growing Areas
APPROVED
CONDITIONALLY APPROVED
CONDITIONALLY RESTRICTED
MANAGEMENT CLOSURE
PROHIBITED
RESTRICTED
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2 Miles
Jane Swift, Governor
Bob Durand, Secretary
Please see data source information on pages 57-59.

Figure 6

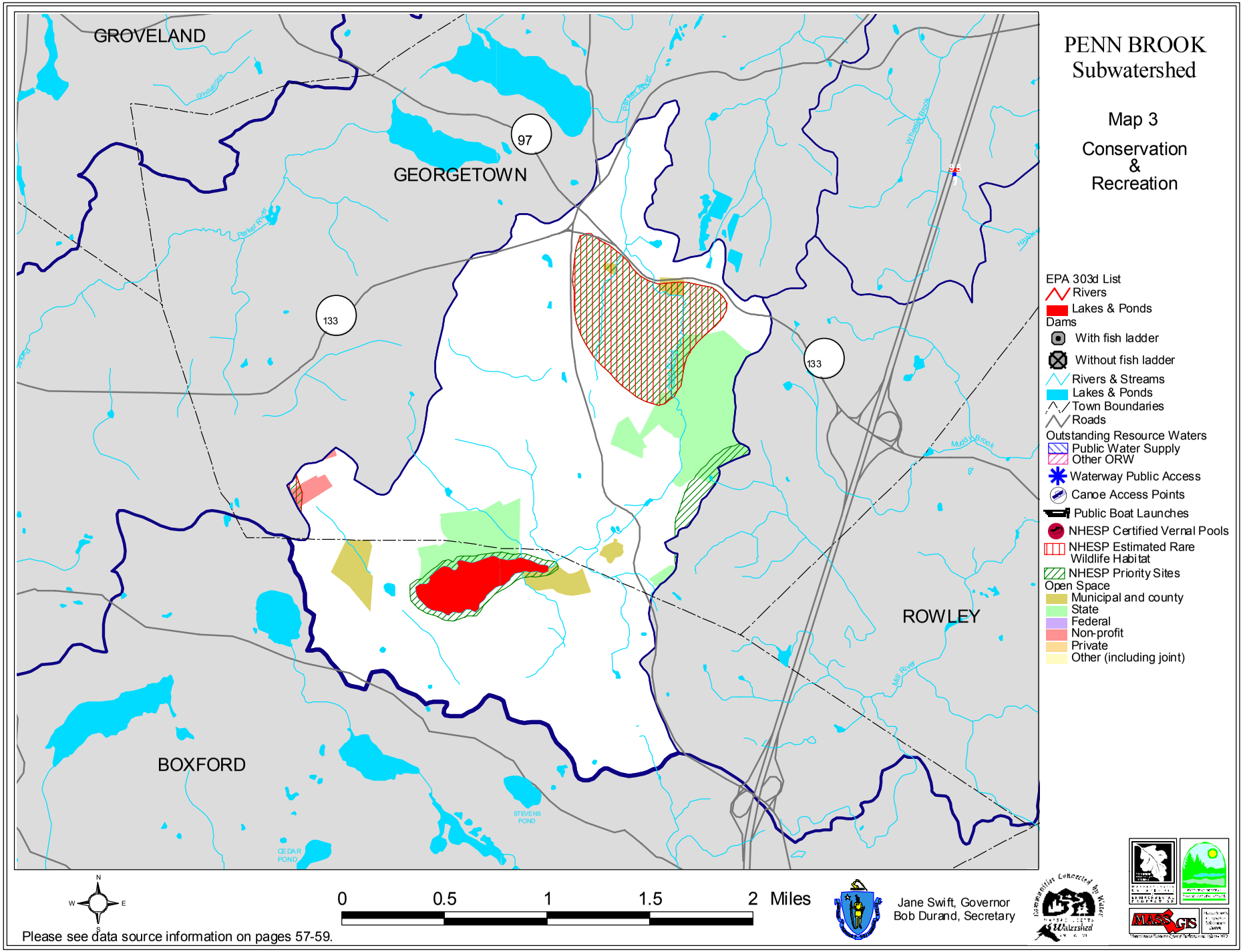

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Figure 7

Wheeler Brook Subwatershed Information

Municipalities: Georgetown

Estimated Population: 1304

General Description: This relatively small subwatershed is located in the northeastern portion of Georgetown. Largely undeveloped it contains some agricultural and residential land use. It is split by interstate highway route 95. Water supply areas that serve Georgetown and Rowley are located in this subwatershed. Residential land use in this subwatershed is 444 acres, up from 334 acres in 1991 while Undeveloped land use is 948 acres, down from 1048 acres in 1991.

Land Area: 1521 acres (2.4 square miles)

Land Use as of 1999: Undeveloped – 948 acres (62% of the subwatershed, Forest is 51%)
Residential – 444 acres (30% of the subwatershed)
Commercial/Industrial – 129 acres (8% of the subwatershed)

Named Tributaries: Jackman Brook

Lakes and Ponds: no named ponds

Rapid Watershed Assessment: The proportion of impervious cover in this subwatershed is estimated to be 8.5%. Based upon this, the water quality should be high quality. While a comprehensive survey has not been done, one would expect to find excellent habitat, diverse communities, and a stable stream channel. However, some localized impacts from summer low flows, road runoff, non-point source pollution and habitat alteration is likely.

Water Quality Information: Wheeler Brook and Jackman Brook have been included in past Department of Environmental Protection water quality monitoring programs. The 1984 survey had two sampling stations on Wheeler Brook. The 1994 survey included two stations on Wheeler Brook and one on Jackman Brook. Also, in 1999 the Department of Environmental Protection Biological Assessment included a station on Jackman Brook, downstream of Jackman Street. The Parker River Clean Water Association has a water quality monitoring station on Wheeler Brook at Parish Road. Data from the Department of Environmental Protection monitoring and from the Parker River Clean Water Association indicate the presence of non-point source pollution. Nitrogen was found to be high during the Department of Environmental Protection water quality surveys and during the Parker River Clean Water Association survey. The biological assessment indicates a limited aquatic habitat, although the macroinvertebrate community has been rated as being “non-impacted”.

Recommendations: Sources of non-point source pollution to Wheeler Brook and Jackman Brook should be identified and corrected. This will help to protect and maintain the apparent high quality of the aquatic biological community. A shoreline survey should be considered here as part of this effort. This subwatershed is also a likely candidate for an open space protection effort.

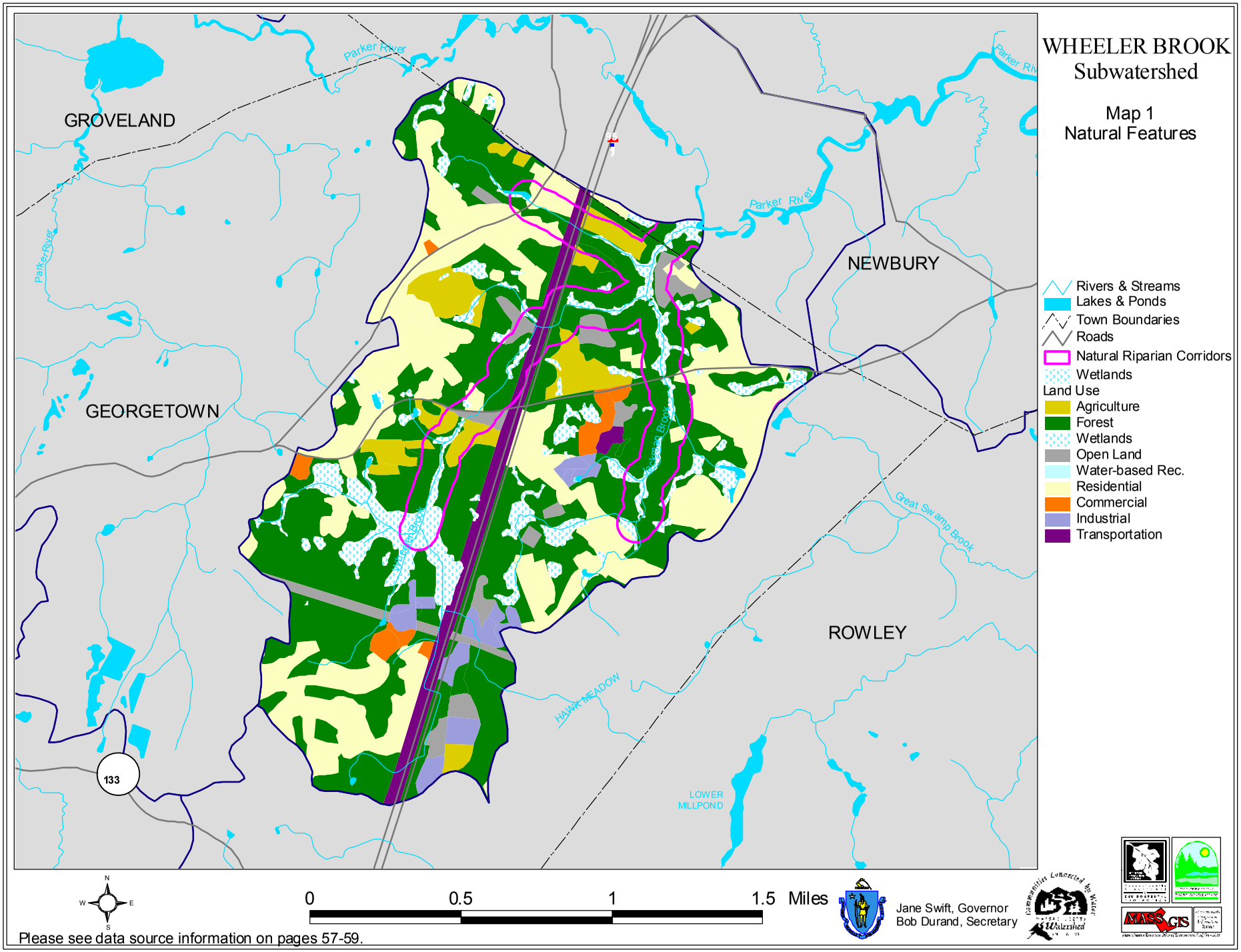

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Figure 8

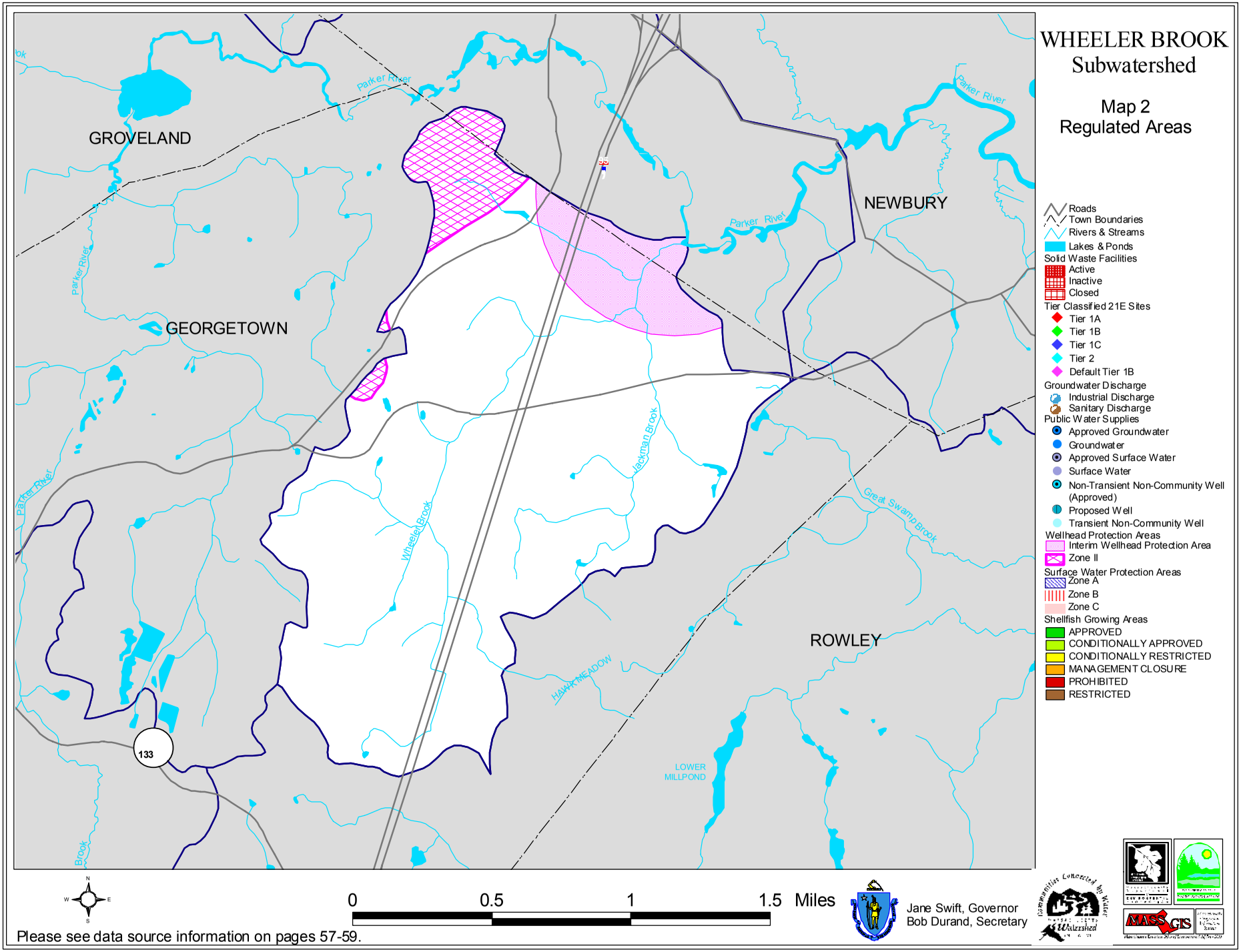

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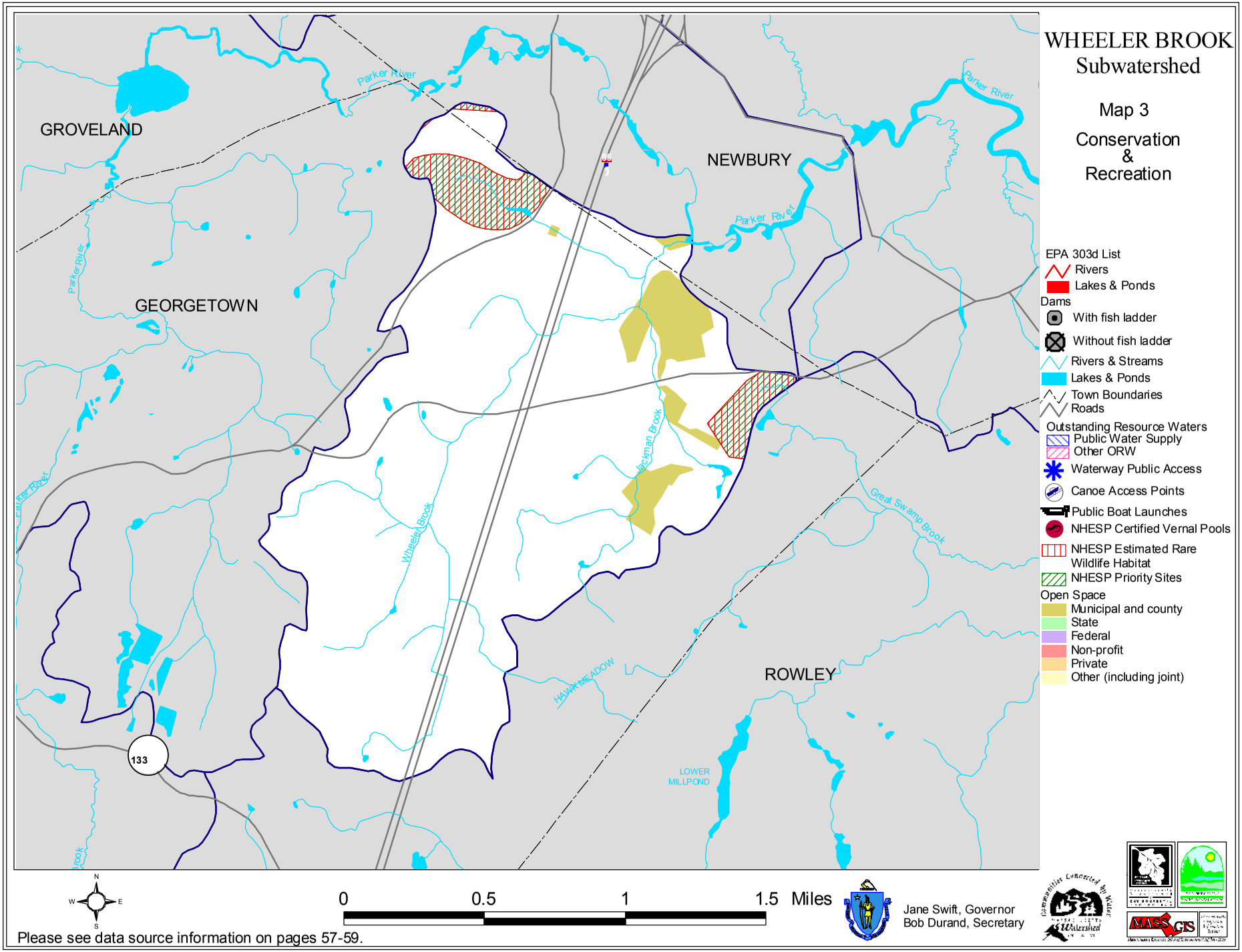
Figure 9



Please see data source information on pages 57-59.

Figure 10

Beaver Brook Subwatershed Information

Municipalities: Primarily West Newbury, also Groveland and Newbury

Estimated Population: 1148

General Description: A number of drumlins rim the perimeter of the Beaver Brook subwatershed. Drainage from this area is collected in wetlands and unnamed streams, which flow into and form Beaver Brook. This flowage drains to the Parker River. The subwatershed is largely forested. Much of the Crane Pond Wildlife Management Area, which is managed by MassWildlife, is found here. Farm fields, tree farms, orchards and pasture are sprinkled throughout the subwatershed. Undeveloped land use has declined from 2006 acres in 1991 to 1983 acres in 1999. Residential land use covered 464 acres in 1999 compared to 288 acres in 1991.

Land Area: 2447 acres (3.8 square miles)

Land Use as of 1999: Undeveloped – 1983 acres (81% of the subwatershed, Forest is 58%)
Residential – 464 acres (19% of the subwatershed)
Commercial/Industrial – 0.0 acres (0% of the subwatershed)

Named Tributaries: none

Lakes and Ponds: Little Crane Pond.

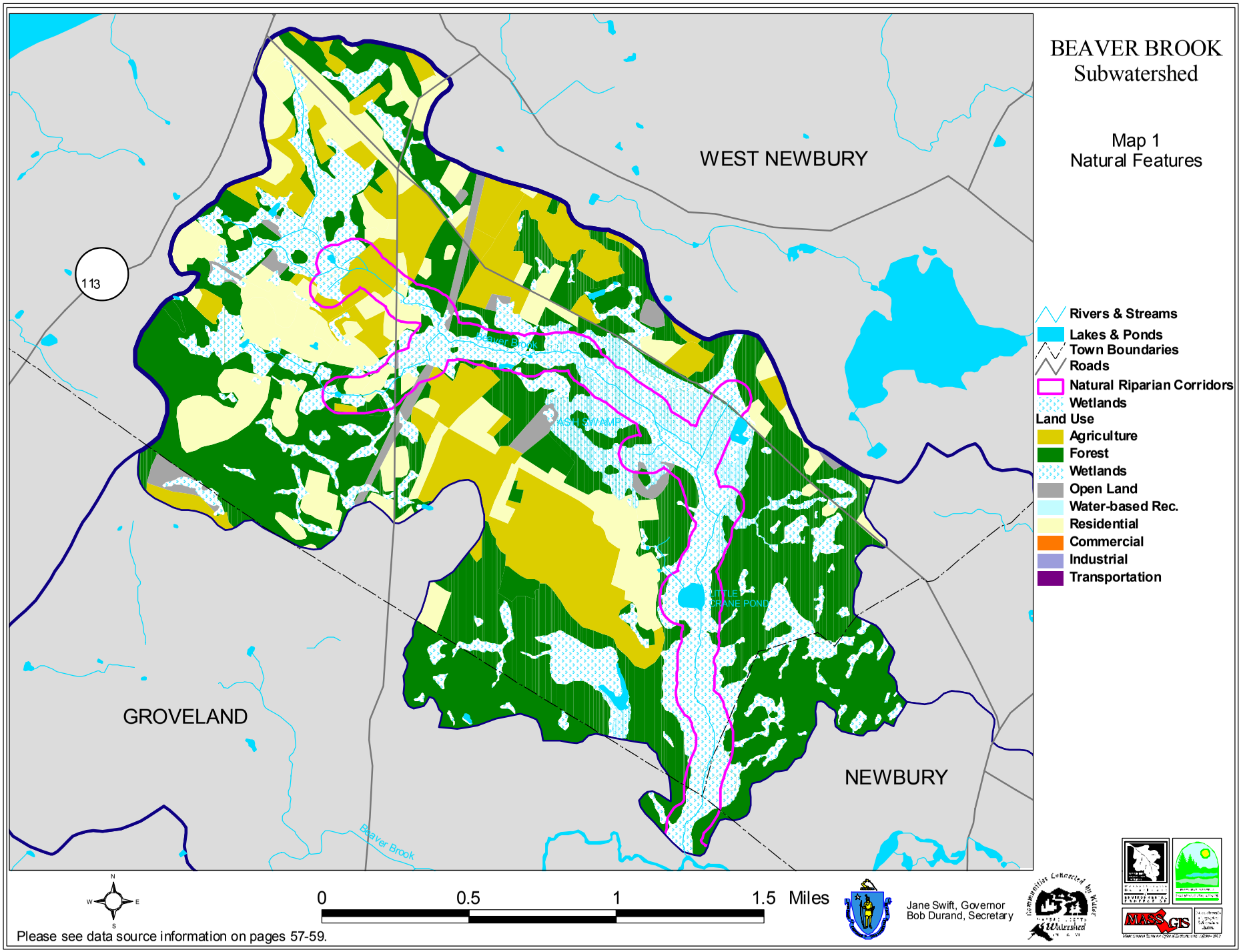
Rapid Watershed Assessment: The proportion of impervious cover in this subwatershed is estimated to be 2.5% based upon 1999 land use information. This is a slight increase from the 1991 estimate of 2.2%. The water quality would be expected to be of high quality. While a comprehensive survey has not been done, one would expect to find excellent habitat, diverse communities, and a stable stream channel. However, some localized impacts from summer low flows, road runoff, non-point source pollution and habitat alteration is likely.

Water Quality Information: Little information is available on the water quality in this subwatershed. The information that is available indicates that the water quality is excellent. There are no known sources of point source or non-point source pollution. The Department of Environmental Protection Division of Watershed Management had two water quality monitoring stations in this subwatershed in previous years. The data from the 1994 water quality assessment indicate that this subwatershed has excellent water quality. The Department of Environmental Protection did not sample these sites in 1999.

Wildlife and Fisheries: Crane Pond Wildlife Management Area contributes to a large portion of this subwatershed. One large area at the boundaries of the Crane Pond Wildlife Management Area was identified by the Watershed Team to be a critical area for open space protection by building upon the already protected wildlife management area. One site for Natural Heritage & Endangered Species Priority Site and Rare Habitat is located within this subwatershed.

Recommendations: One consideration would be to work with the local open space committees and the Open Space Committee Network recently established by Massachusetts Coastal Zone

Management and the Massachusetts Audubon Society. The open space committees of Georgetown and West Newbury could work together to identify unprotected open space parcels and develop a plan to increase the amount of protected open space through acquisition, conservation restrictions and other innovative means. Need to locate and certify vernal pools. Conduct stream survey and aquatic habitat survey.


BEAVER BROOK
Subwatershed
Map 1
Natural Features
WEST NEWBURY
GROVELAND
NEWBURY
113
Beaver Brook
ASH SWAMP
LITTLE CRANE POND
Beaver Brook
Rivers & Streams
Lakes & Ponds
Town Boundaries
Roads
Natural Riparian Corridors
Wetlands
Land Use
Agriculture
Forest
Wetlands
Open Land
Water-based Rec.
Residential
Commercial
Industrial
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Jane Swift, Governor
Bob Durand, Secretary
Please see data source information on pages 57-59.

Figure 11

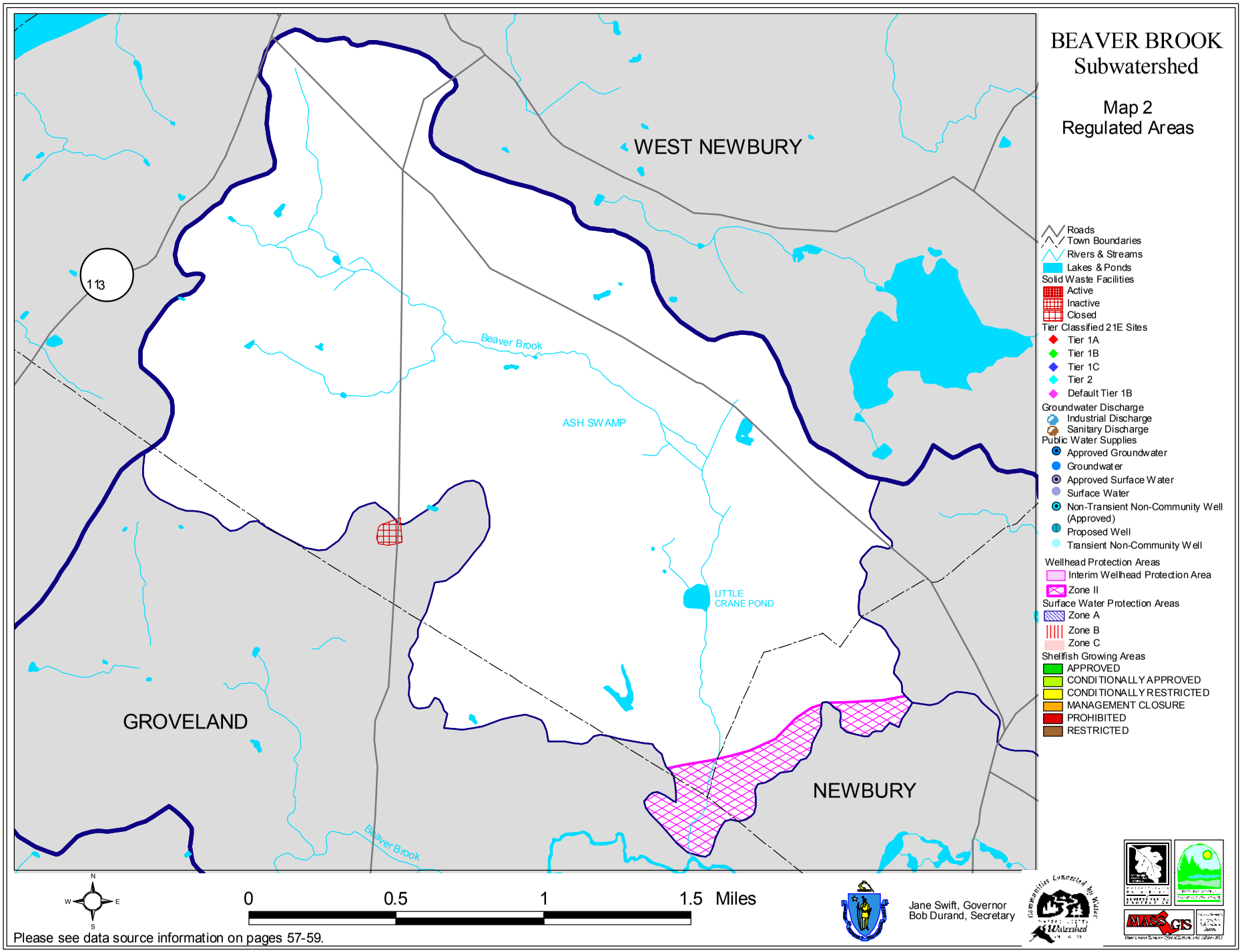

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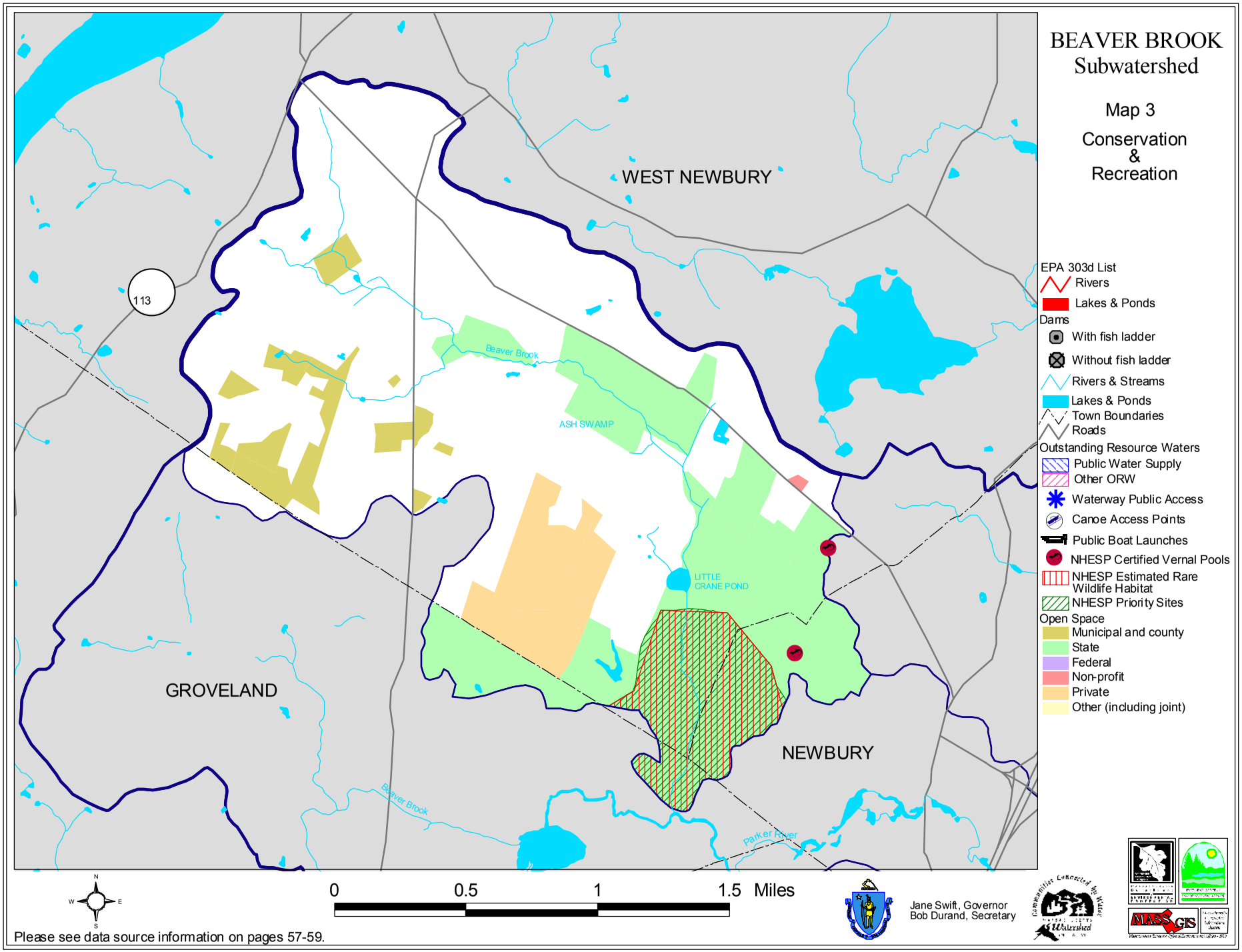
Figure 12



Please see data source information on pages 57-59.

Figure 13

Little River Subwatershed Information

Municipalities: Newbury, Newburyport.

Estimated Population: 9225

General Description: This subwatershed contains the Newburyport Industrial Park, commercial retail properties, an inactive, unlined landfill in Newburyport, an active landfill in Newbury, agricultural land, as well as protected open space under state and private ownership. It is located in the northernmost part of the Parker River watershed and is a major influence on the water quality to the most downstream segment of the Parker River. The Little River subwatershed is the second largest subwatershed in the Parker River Watershed, after the Mill River subwatershed. Undeveloped land use has remained the same in the last decade (estimated to be 4600 acres in 1991 and 4625 acres in 1999). Residential land use is up from 996 acres in 1991 to 1592 acres in 1999.

Acres/Square Miles: 6866 acres (10.7 square miles)

Land Use as of 1999: Undeveloped – 4625 acres (67% of the subwatershed, Forest is 31%)
Residential – 1592.5 acres (23% of the subwatershed)
Commercial/Industrial – 649 acres (9% of the subwatershed)

Named Tributaries: none

Lakes and Ponds: Quills Pond

Rapid Watershed Assessment: The proportion of impervious cover in this subwatershed is estimated to be 10.5% based upon 1999 land use information. There has been little change in impervious area in this subwatershed when compared to the 1991 land use information. This amount of impervious area indicates that the subwatershed is likely to be affected by urbanization. These affects include greater stormwater runoff and flooding, alteration of stream habitat, impacts to stream water quality, and a declining stream biodiversity. Aquatic life is also affected. Although the indications are that this subwatershed is affected by urbanization there is an opportunity to improve conditions. Shellfish (recreational oyster fishery) is the primary sensitive resource in the tidal portion of the subwatershed.

Water Quality Information: Water quality in this subwatershed is degraded. The water quality standards are not met in this subwatershed due to various sources of pollution. This subwatershed has a highly sensitive designated use (shellfishing). Information from a number of sources indicate that this subwatershed exceeds the fecal coliform bacteria standard. Stormwater and non-point source pollution from the Newburyport Industrial Park and some agricultural land use appear to be the primary cause of this exceedance. A recently completed study by the Merrimack Valley Planning Commission indicates that non-point source pollution is a major contributor of pollution in this subwatershed. In addition, sub basins in the upper portions of this subwatershed have high percentages of impervious area, which contribute to poor water quality. Consistent with this information are the findings of the Division of Marine Fisheries Shellfish Program. Their assessment of water quality reveal that the highest levels of fecal coliform in the Little River are found between Hale Street and Hanover Street. Shellfishing standards are exceeded during dry and

wet weather conditions on a regular basis. While there is little shellfish in the Little River (except for a recreational oyster fishery), the quality of water in the Little River has a direct affect on the water quality of the Parker River. A dye study conducted by the Division of Marine Fisheries and the U. S. Food and Drug Administration revealed that the Little River affects an area of the Parker River one mile downstream of the mouth of the Little River. According to the Massachusetts Audubon Society Minibay Study nearly 50% of the fecal coliform bacteria found in the Parker River portion of Plum Island Sound comes from the Little River subwatershed. However, the Little River contributes less than 10% when compared to all potential loadings to Plum Island Sound (Parker River, Little River, Rowley-Egypt Rivers, Ipswich River estuary, Ipswich River, Miles River and Kimball Brook). A 1994 survey conducted by the Department of Environmental Protection Division of Watershed Management included 17 sampling stations, which were sampled during dry, low flow conditions. High phosphorous concentrations and fecal coliform (700-800 colonies per 100 ml) were found at some monitoring stations. Some tributaries to the Little River also showed elevated phosphorous.

Recommendations: As indicated by the existing water quality monitoring data, the Little River does not achieve its designated uses. The causes are attributed to non-point source pollution and stormwater runoff. It is recommended that the City of Newburyport inspect the sanitary sewer system in the Industrial Park for breaks and leaks and other potential sources of pollution. Efforts should also be directed to septic system maintenance, especially in the Town of Newbury. Better housekeeping practices to minimize the attraction of flocks of birds and other wildlife will help to reduce sources of pollution. It is also recommended that government agencies continue to assist agricultural operations with the implementation of best management practices to control non-point source pollution. Causes of flooding in the Newburyport Industrial Park need to be investigated and corrected.

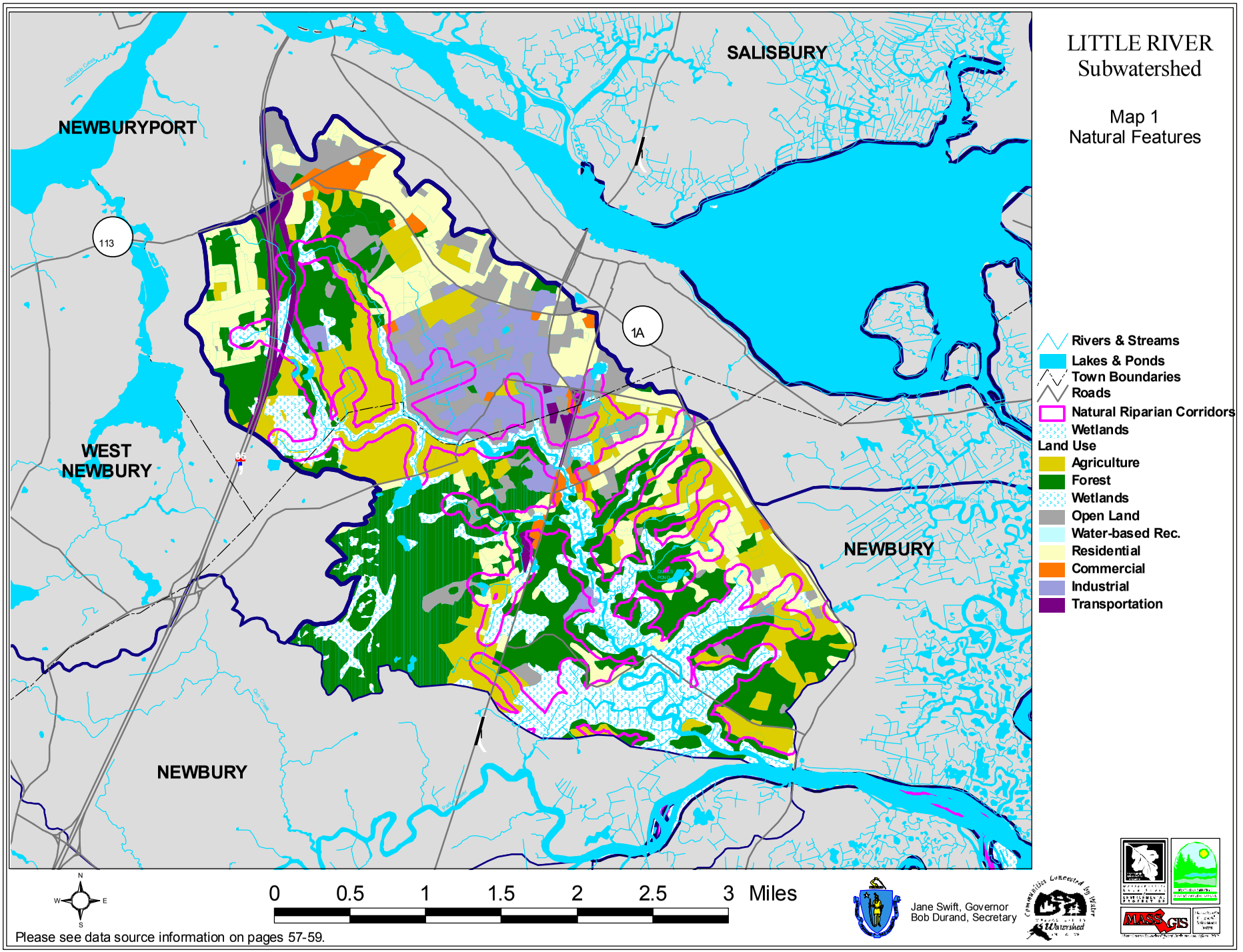


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Figure 14

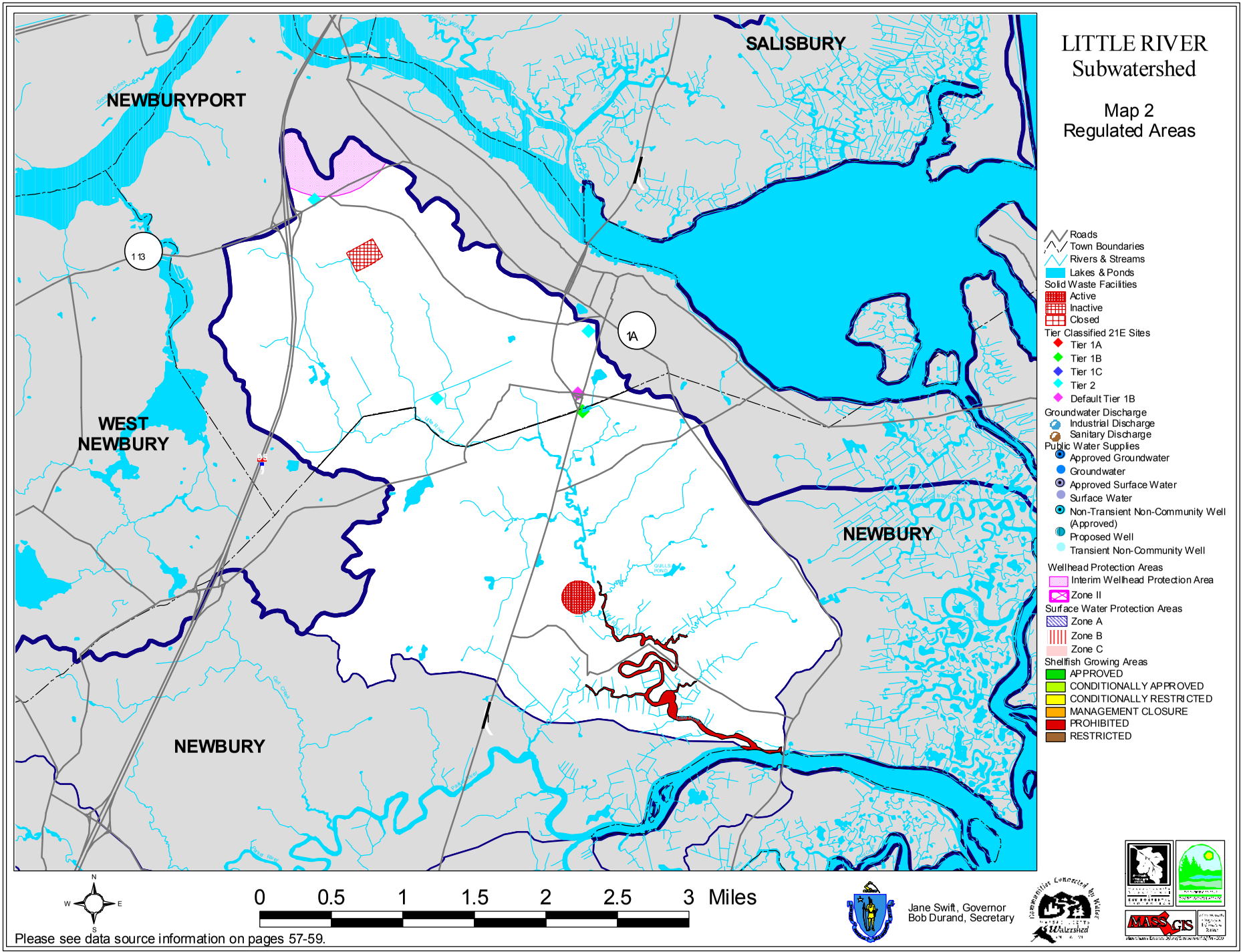

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Figure 15

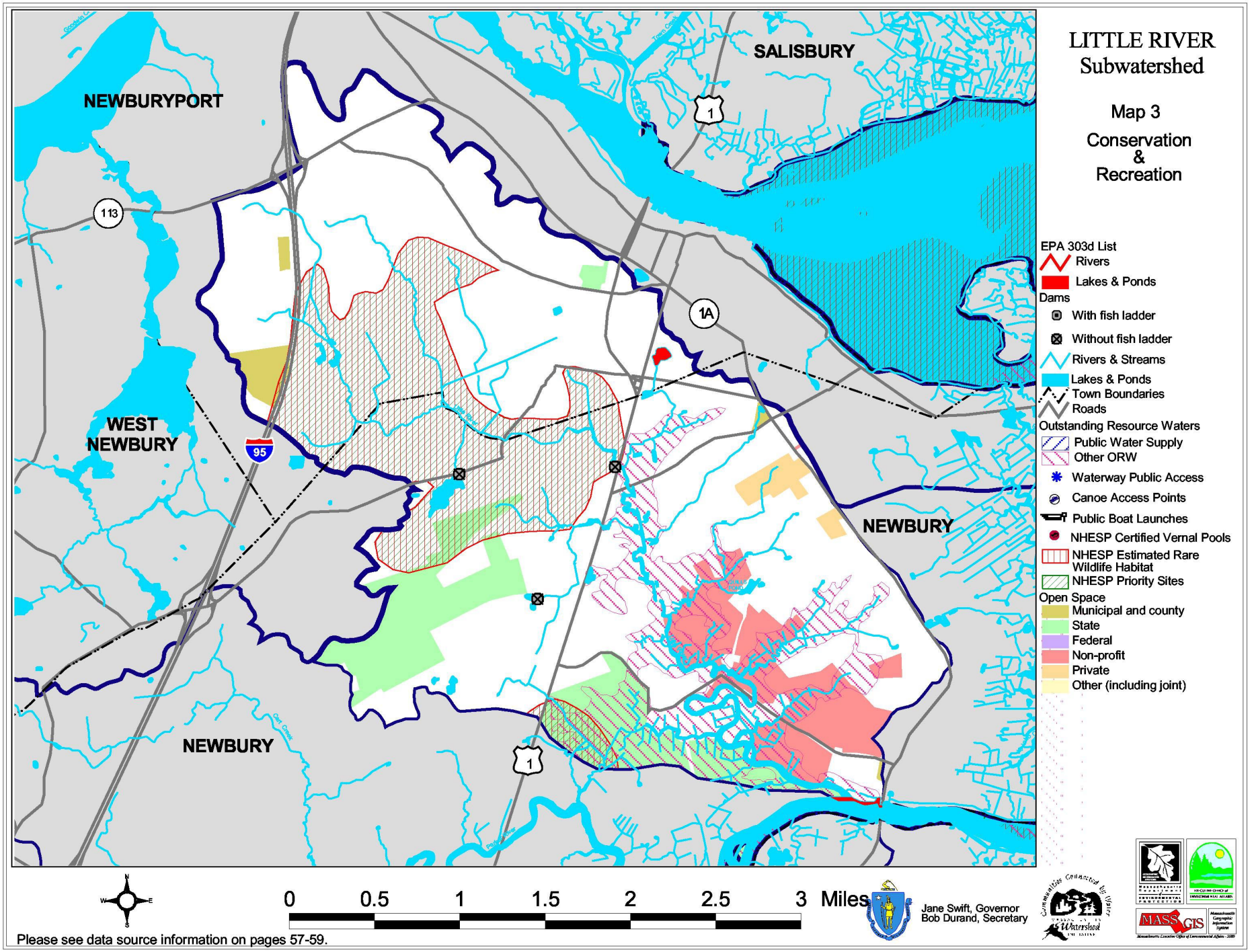

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Figure 16

Mill River Subwatershed Information

Municipalities: Boxford, Georgetown, Newbury, Rowley, Ipswich

Estimated Population: 5696

General Description: The Mill River is the largest tributary system of the Parker River and includes much of the Town of Rowley. Land use is primarily undeveloped and residential, although there are commercial/industrial areas along Route 1 and Route 1A. Additional commercial/industrial development is occurring along these transportation corridors and more is anticipated. Rowley's Watershed Protection and Floodplain District is located in this subwatershed as are its existing and planned water supply wellfields. Concerns have been raised recently that the existing well fields adversely affect baseflow in the Mill River subwatershed. Governor Dummer Academy is located near the tidal portion of Mill River. It has a wastewater treatment facility that discharges to an unnamed tributary of the Mill River. This wastewater treatment facility recently underwent significant modifications, which will result in improvements to the quality of the discharge. Portions of the Georgetown-Rowley State Forest, Willowdale State Forest and Mill Creek Wildlife Management Area are located in this subwatershed. All tidal portions of this subwatershed are located in the Parker River/Essex Bay Area of Critical Environmental Concern. The Mill River once had an anadromous fishery (blueback herring and alewives), however the lack of a fish passage facility at the Jewel Mill (Glen Mills dam) impedes fish movement upstream to their spawning habitat. Undeveloped land use declined from 8870 acres in 1991 to 8459 acres in 1999, while Residential land use has risen from 1643 acres in 1991 to 2558 acres in 1999.

Land Area: 11494 acres (18 square miles)

Land Use as of 1999: Undeveloped – 8459 acres (74% of the subwatershed, Forest is 58%)
Residential – 2558 acres (22% of the subwatershed)
Commercial/Industrial – 484 acres (4% of the subwatershed)

Named Tributaries: Ox Pasture Brook, Bachelder Brook, Great Swamp Brook, Muddy Brook.

Lakes and Ponds: Wilson Pond, Upper Mill Pond, Lower Mill Pond, Central Street Pond.

Rapid Watershed Assessment: The proportion of impervious cover in this subwatershed is estimated to be 5.3%. The water quality would be expected to be of high quality. While a comprehensive survey has not been done one would expect to find excellent habitat, diverse communities, and a stable stream channel. However, some localized impacts from summer low flow, road runoff, non-point source pollution and habitat alteration is likely. Additional impacts are expected with future growth, predicted by recently completed build-out analysis.

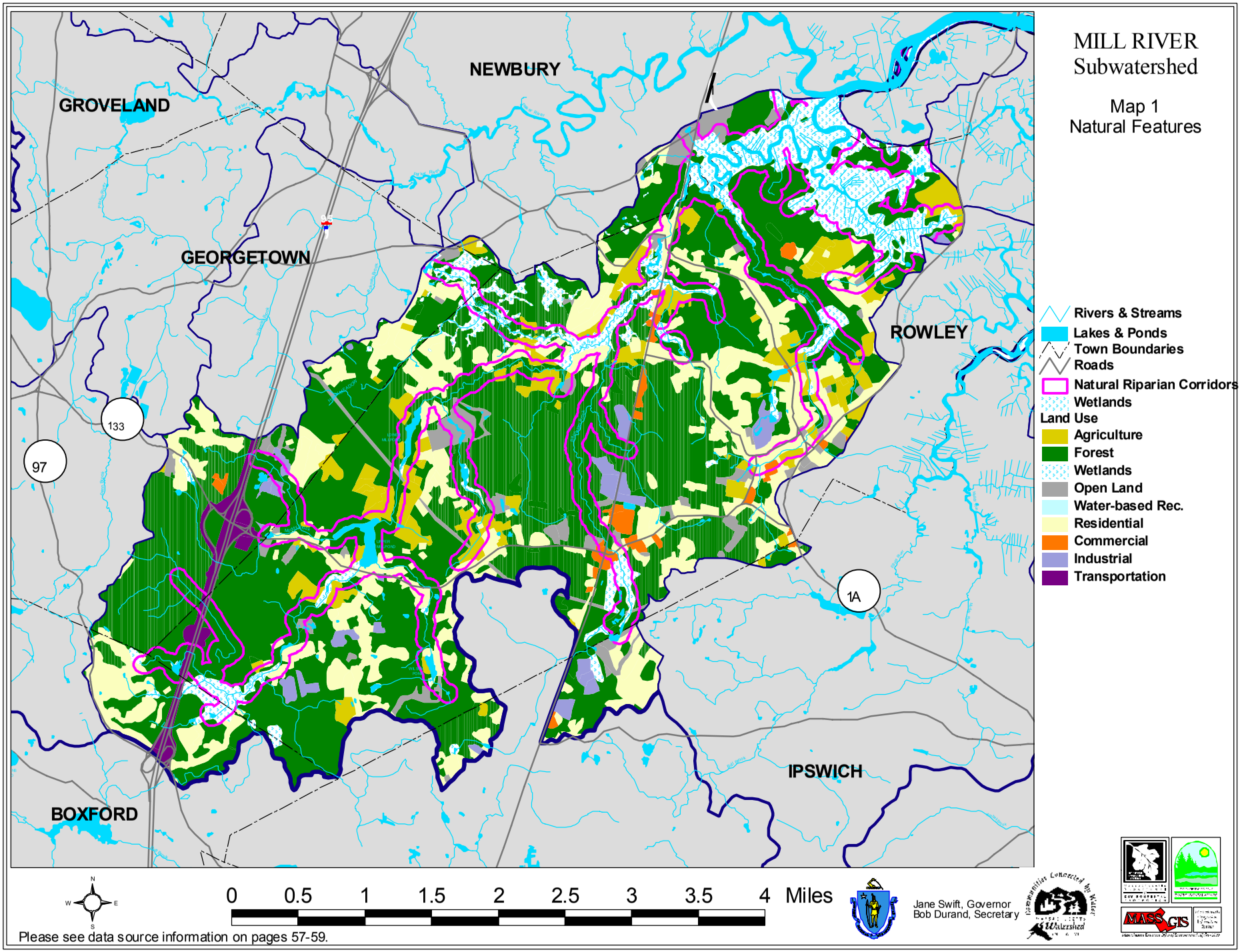
Water Quality Information: The Department of Environmental Protection Division of Watershed Management has included the Mill River, Great Swamp Brook, Bachelder Brook and Ox Pasture Brook in their water quality monitoring programs. The 1994 survey had 4 sampling locations on Mill River (plus 2 near Governor Dummer), one on Great Swamp Brook, two on Bachelder Brook and two on Ox Pasture Brook. The Department of Environmental Protection did not conduct water quality sampling during the 1999 sampling year. However , biological monitoring was conducted

at one station on Mill River and one station on Ox Pasture Brook in 1999. The Division of Marine Fisheries Shellfish Program last monitored water quality in the Mill River in 1994. Due to high bacteria the Mill River is classified as "Closed" to shellfishing. The Massachusetts Audubon Society conducted water quality sampling at 18 sites in this subwatershed as part of its Plum Island Sound Minibay Project and the Non-Point Source Comprehensive Implementation Program for the Mill River Subwatershed. The Parker River Clean Water Association has located 3 sampling sites in this subwatershed (Jewel Mill, Route 1 at Elm Street, and Fenno Drive) as part of their volunteer monitoring program.

Water quality is affected in this subwatershed from localized sources of bacteria from non-point source pollution, failed septic systems, cesspools, domestic animals and feral animals. Wilson Pond, Lower Mill Pond, and Upper Mill Pond are included on the Department of Environmental Protection's list of waterbodies not in compliance with the state's surface water quality standards. They are listed due to the presence of noxious aquatic plants. Non-point source pollution from agricultural sources to Mill River has been identified. Some of these sources are in the process of being corrected through cooperative efforts by landowners, town and state and federal agencies. Reported and identified water quality problems in the vicinity of Governor Dummer Academy have been addressed through a recent upgrade and operational improvements to the wastewater treatment facility at that property. Some sources identified through the Massachusetts Audubon Society's Non-Point Source Comprehensive Implementation Program for the Mill River Subwatershed have been addressed. Remaining pollution sources can be addressed by continuing to implement the septic system management program, by implementing best management practices for road runoff and stormwater and by seeking to address the failing septic systems in Rowley Center. The biological assessment conducted by the DEP at the Mill River site in the vicinity of the Jewel Mill indicates generally very good aquatic habitat, however the macroinvertebrate community was rated as being "slightly impacted". The biological assessment site on Ox Pasture Brook, near Fenno Drive, indicated excellent aquatic habitat and the macroinvertebrate community was rated as being non/slightly impacted.

Recommendations: Support the efforts of the Great Marsh teams, especially with regards to evaluating the potential of providing passage of anadromous fish to Mill River at the Jewel Mill or evaluating removal of the dam. Since a significant proportion of open space is not permanently protected it should be a priority to work with the Town of Rowley to identify priority areas for protection. The local open space and recreation committee should be encouraged to continue to work closely with the Open Space Committee Network that was recently created.

Due to the identified water quality problems in this subwatershed the recommendations from the work conducted by the Department of Environmental Protection, Division of Watershed Protection and the Massachusetts Audubon Society should become a priority of the watershed team. These include outreach on septic system maintenance, inspections of septic systems in the known problem areas, implement best management practices related to stormwater control, improve baseflow in the Ox Pasture Brook tributary, conduct fish community and macroinvertebrate sampling in the Ox Pasture Brook tributary, evaluate the success of the septic system maintenance program, provide assistance to the problem site in the center of town and seek additional low interest loans through DEP and others for septic system upgrades.



Please see data source information on pages 57-59.

Figure 17

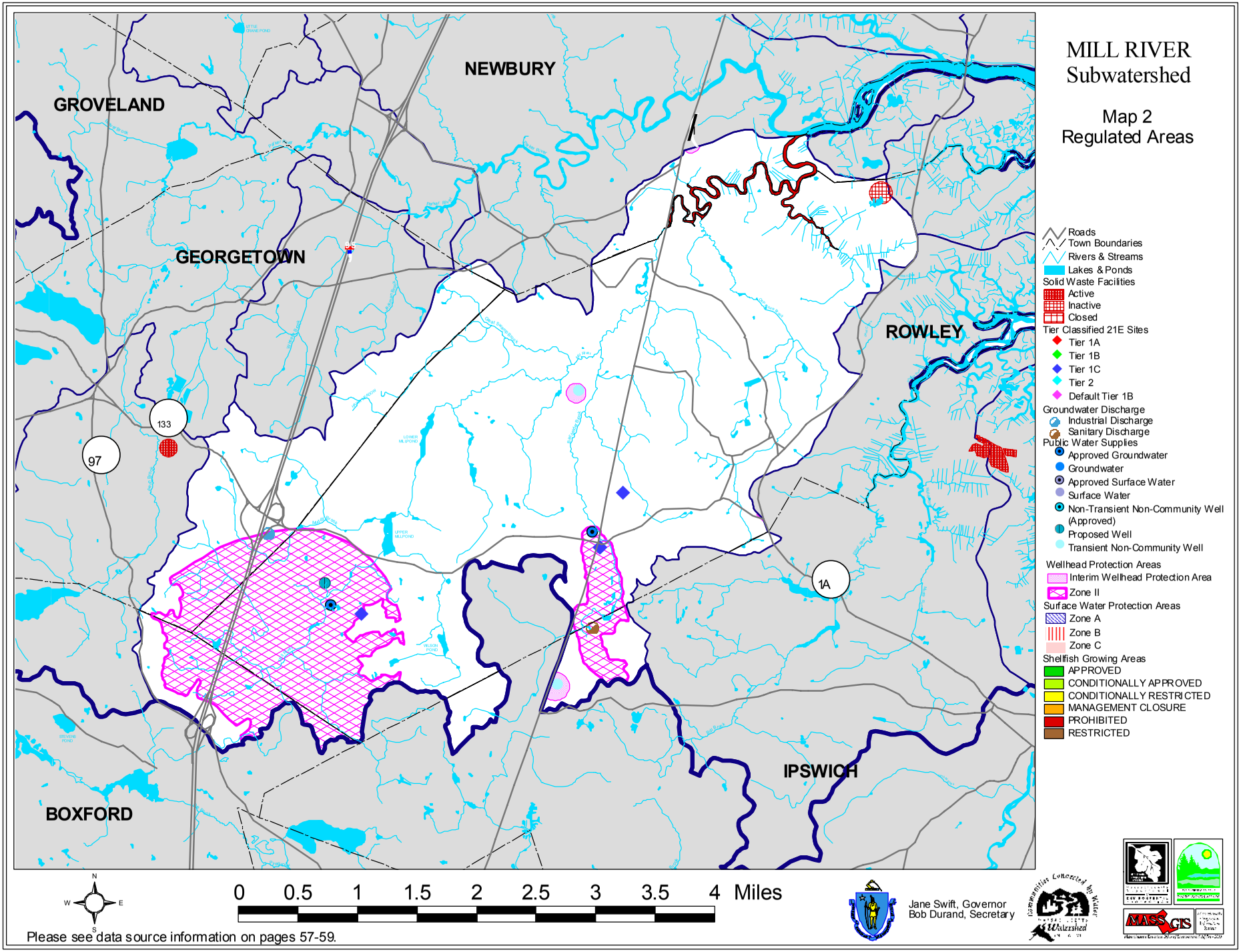


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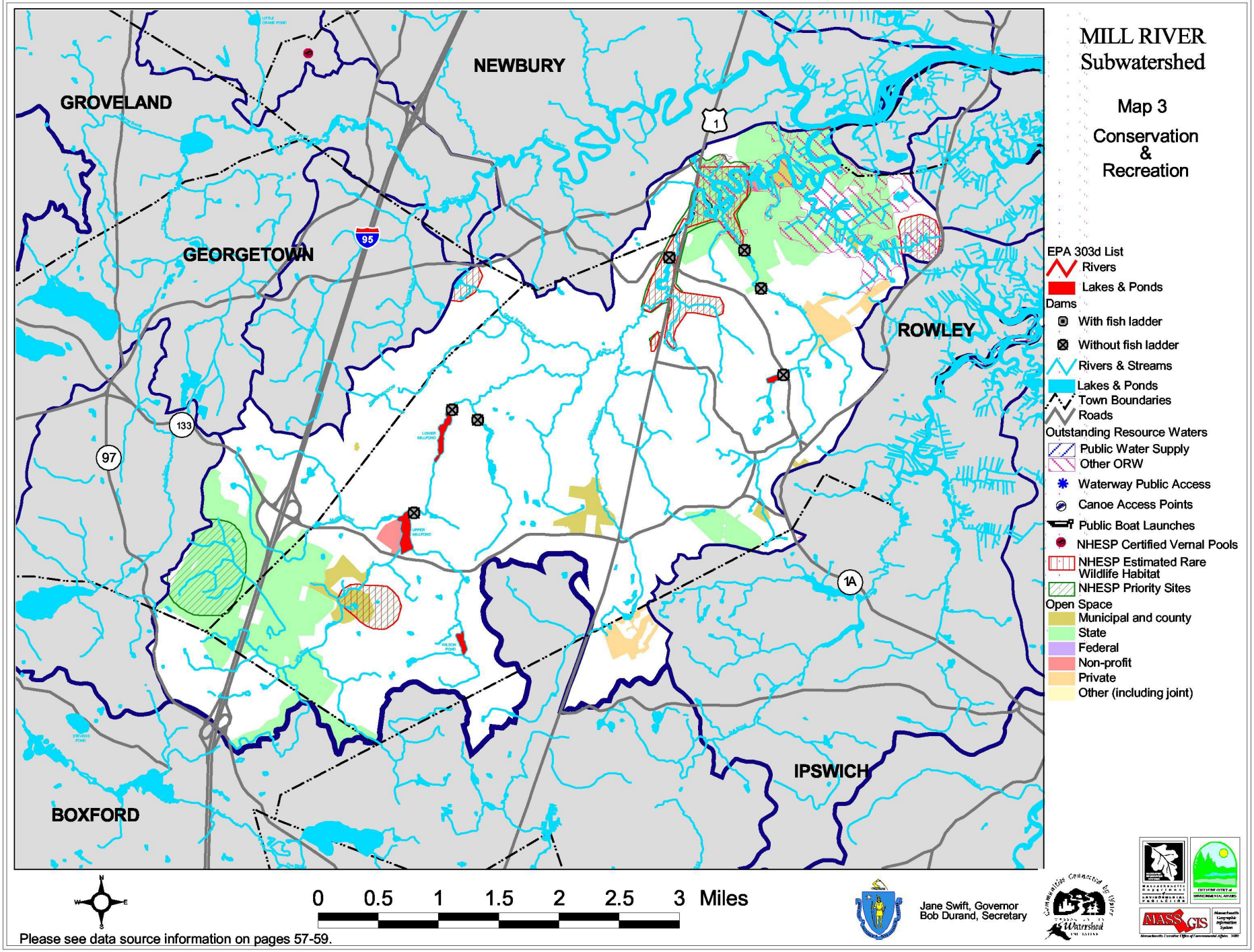
Figure 18



Please see data source information on pages 57-59.

Figure 19

Rowley River and Egypt River Subwatershed Information

Municipalities: Rowley and Ipswich

Estimated Population: 3507

General Description: A tidal river system that is influenced by Bull and Dow Brook, two freshwater tributaries. Bull Brook Reservoir and Dow Brook Reservoir, which serve the town of Ipswich, are located in this subwatershed. Public water supply wells for the town of Ipswich are also located in this subwatershed. A portion of this subwatershed is located in the Parker River/Essex Bay Area of Critical Environmental Concern. A non-functional fishway is located on the Egypt River, just downstream of the two reservoirs. Recreational boaters enjoy the tidal section of this subwatershed accessing it from the Rowley Town Landing. A portion of Willowdale State Forest is located in the headwaters, as are some other parcels of protected open space. Some areas of Natural Heritage & Endangered Species Priority Site and Rare Habitat are located within this subwatershed. Shellfishing occurs primarily in the Rowley River east of the railroad bridge and the flats adjacent to the Rowley River. At one time there was a recreational oyster fishery in the Rowley River. The potential for this still exists as there remains good habitat for oysters. All shellfish waters in this subwatershed are classified as "Conditionally Approved", except for the Eagle Hill River, which is "Conditionally Closed" during July and August. Residential land use has increased slightly, up from 614 acres in 1991 to 628 acres in 1999. Undeveloped land use is nearly unchanged from 5284 acres in 1991 to 5267 in 1999.

Acres/Square Miles: 6120 acres (9.6 square miles)

Land Use as of 1999: Undeveloped –5267 acres (86% of the subwatershed, Forest is 45%)
Residential – 628 acres (10% of the subwatershed)
Commercial/Industrial – 225 acres (4% of the subwatershed)

Named Tributaries: Club Head Creek, Shad Creek, West Creek, Sand Creek, Muddy Run, Dow Brook, Bull Brook.

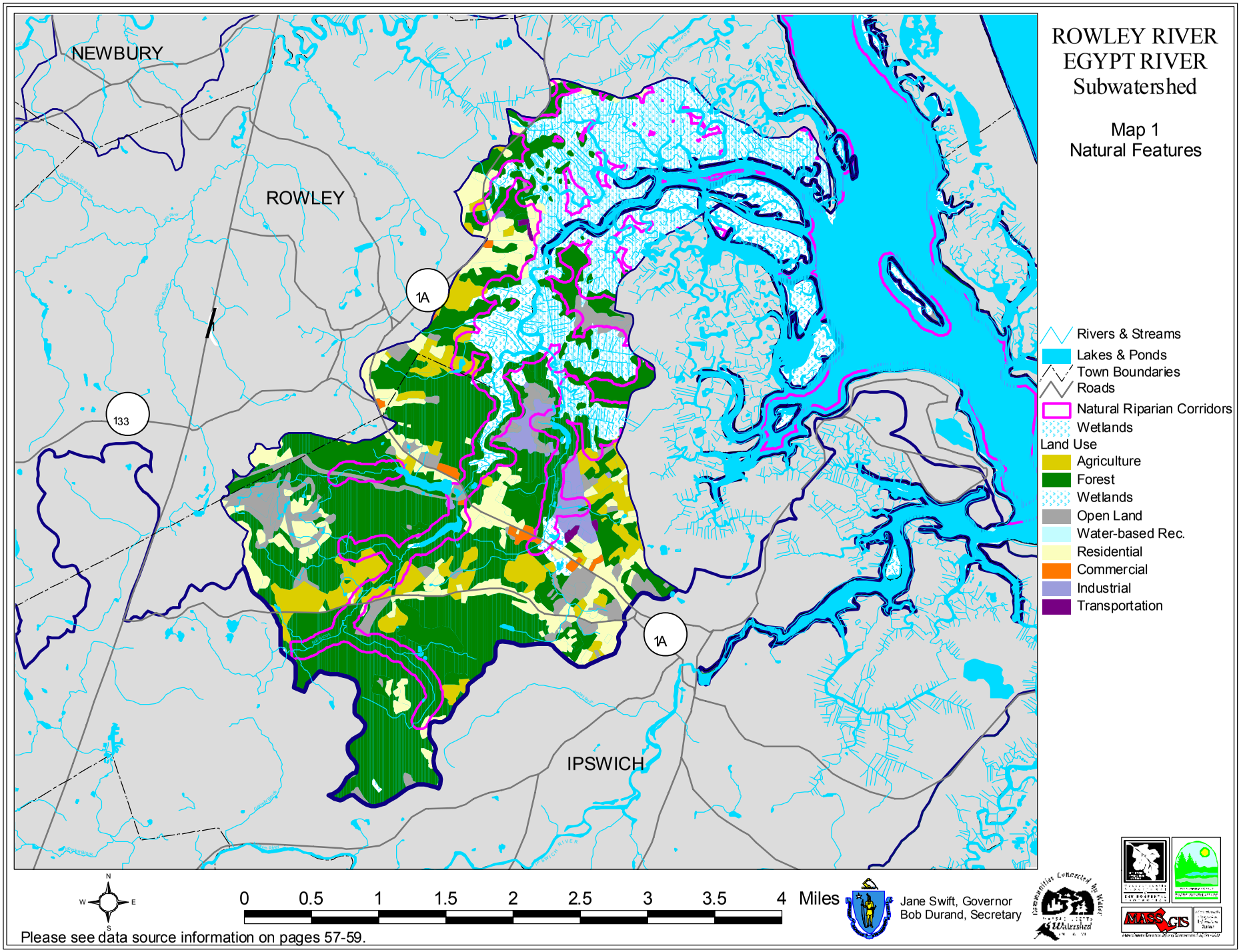
Lakes and Ponds: Bull Brook Reservoir, Dow Brook Reservoir

Rapid Watershed Assessment: The proportion of impervious cover in this subwatershed is estimated to be 0.3%. The water quality would expected to be of high quality. While a comprehensive survey has not been done, one would expect to find excellent habitat, diverse communities, and a stable stream channel. However, actual water quality information exists that indicates influences from stormwater and potentially boat waste. Shellfish is the primary sensitive resource in the tidal portion of the subwatershed.

Water quality information: Water quality in this subwatershed is affected in several locations by stormwater. The shellfish beds are conditionally approved for harvesting, except for July and August in the Eagle Hill River. They are closed after certain rainfall events due to bacterial contamination, primarily from stormwater. Water quality data indicate that after rainfall events bacterial contamination increases and the greatest increases are in the vicinity of the Rowley town landing. Bacteria is monitored by the Division of Marine Fisheries at various locations within the

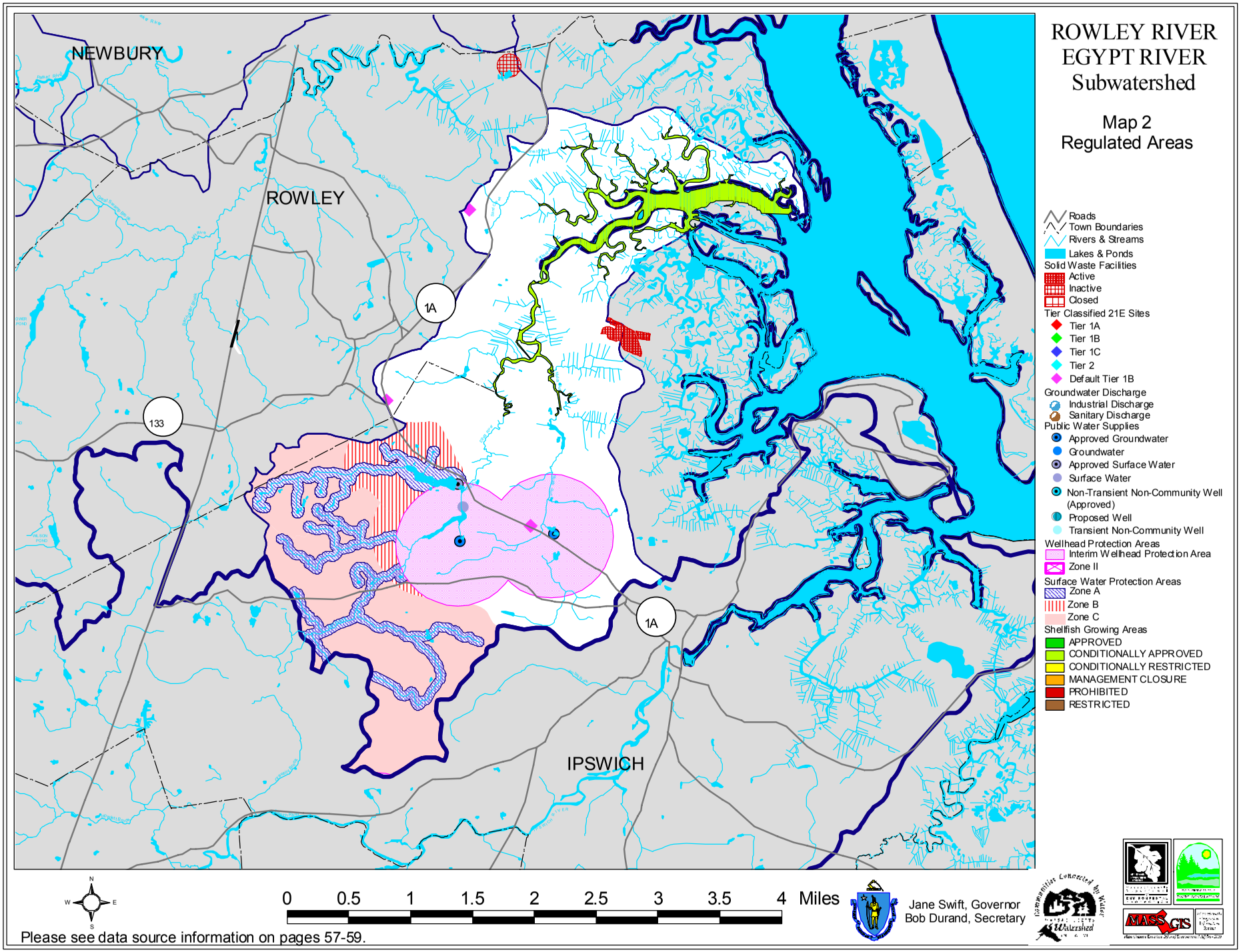
tidal segments of this subwatershed. The Massachusetts Audubon Society included monitoring stations in this subwatershed as part of the Plum Island Sound Minibays study. The Marine Biological Laboratory is also conducting research in this subwatershed. The Parker River Clean Water Associations includes a monitoring station at the Rowley Town Landing as part of their monthly volunteer monitoring program.

Recommendations: Support the efforts and projects of the Great Marsh teams. Continue to promote stormwater management and boat waste management. Identify unprotected open space and work with landowners and communities to encourage land protection through conservation restriction and acquisition. Work with municipalities and land trusts to implement open space protection strategies. Promote outreach and education efforts directed towards boat waste management. Work to implement the recommendations contained in the ACEC management plan. Evaluate the feasibility and benefits of repairing the fishway on the Egypt River.



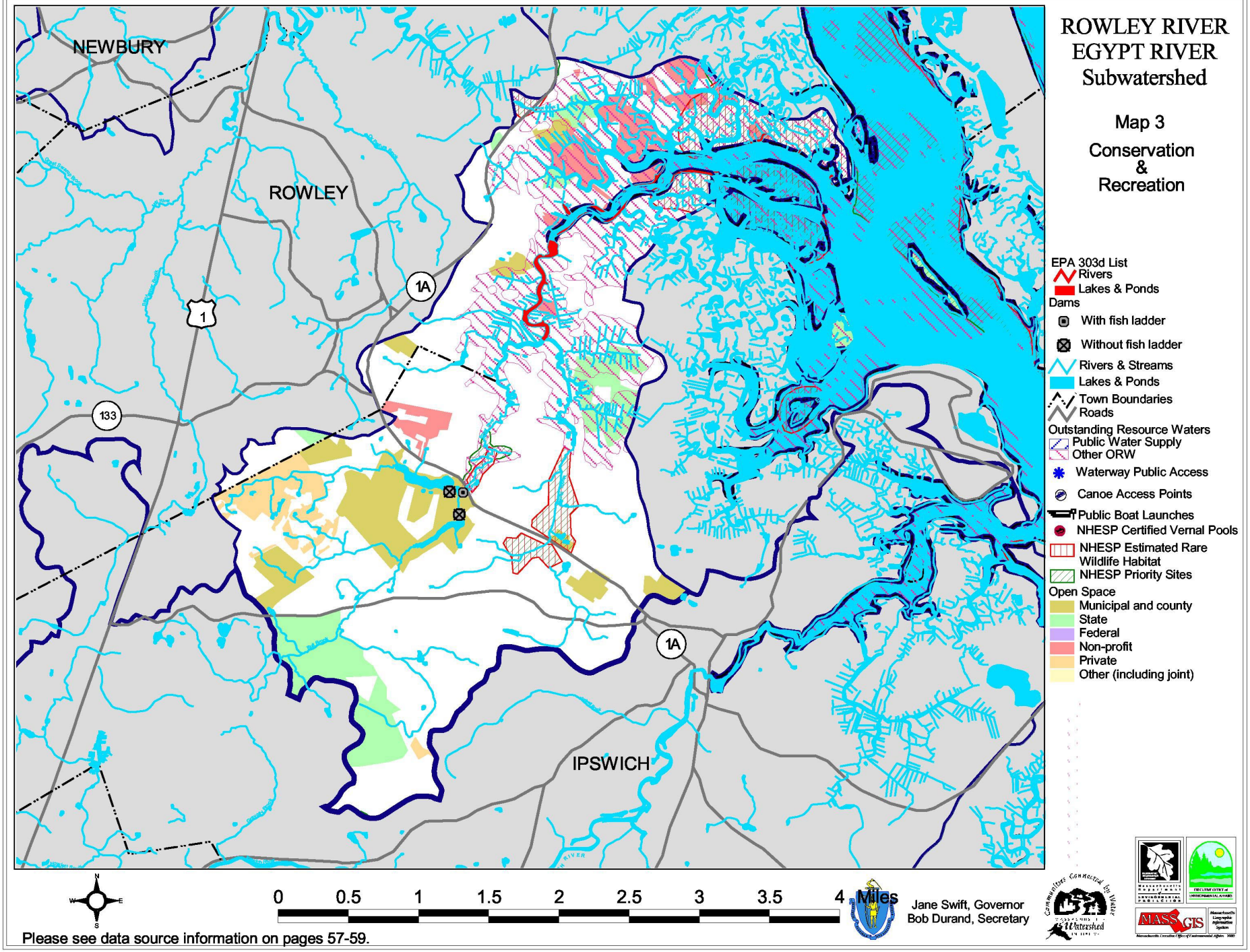
Please see data source information on pages 57-59.

Figure 20



Please see data source information on pages 57-59.

Figure 21



Please see data source information on pages 57-59.

Figure 22

Parker River Tidal Subwatershed Information

Municipalities: Newbury and small portions of Georgetown, West Newbury and Rowley

Estimated Population: 2007

General Description: This tidally influenced subwatershed begins at the Central Street dam in the Byfield section of Newbury and extends to Plum Island Sound. The river meanders through an expansive salt marsh on its final nine-mile course to Plum Island Sound. A portion of the Parker River/Essex Bay Area of Critical Environmental Concern is located here. Portions of the Parker River Wildlife Refuge, managed by the United States Fish and Wildlife Service are also included in this subwatershed, as are some properties managed by MassWildlife. The two predominant land use cover types are Forest (49.5%) and Salt Marsh (20.5%). The Triton Regional High School has a wastewater treatment facility, which was recently repaired and upgraded. Wastewater is treated at this facility and discharged to the ground on the school's property. Residential land use has risen from 597 acres in 1991 to 748 acres in 1999. Undeveloped land use has changed from 4133 acres in 1991 to 4006 in 1999.

Land Area: 4888 Acres (7.6 Square Miles)

Land Use as of 1999: Undeveloped – 4006 acres (82% of the subwatershed, Forest is 47%)
Residential – 748 acres (15% of the subwatershed)
Commercial/Industrial – 135 acres (3% of the subwatershed)

Named Tributaries: Cart Creek

Lakes and Ponds: none

Rapid Watershed Assessment: The proportion of impervious cover in this subwatershed is estimated to be 4%. Based upon this, the water quality would be expected to be very high quality. While a comprehensive survey has not been done, one would expect to find excellent habitat, diverse communities, and a stable stream channel. However, some localized impacts from summer low flows, road runoff, non-point source pollution and habitat alteration is likely. Impacts are expected with future growth, predicted by recently completed build-out analysis. The most sensitive resource in this subwatershed is the shellfish resources. Due to non-point source pollution from various sources the shellfish resources cannot be fully utilized and are subject to periodic closures. Some areas are classified as "Prohibited" from harvesting.

Water Quality Information: Water quality in this segment is affected by non-point source pollution as shown through monitoring by the Department of Environmental Protection Division of Watershed Management, the Massachusetts Division of Marine Fisheries Shellfish Program, the Parker River Clean Water Association and by Massachusetts Audubon Society. In general, water quality declines during rainfall events. Cart Creek has been shown to have high nitrate-nitrogen and phosphorous. Dissolved oxygen has also been shown to be depressed at various locations in the estuary. Harvesting of shellfish is "Prohibted" from up river of Cottage Road, Newbury. It is "Conditionally Approved" down river from Cottage Road. Note that shellfish surveys indicate few shellfish upstream of Cottage Road (some oysters), with more softshell clams located downstream

of Cottage Road, generally because of the lack of suitable habitat. Besides pollution sources from failed septic systems and stormwater, improper waste disposal from marinas and boats contributes to water quality problems. Hopefully these on-the-water sources will be curtailed with the use of pumpout facilities administered by the local communities through the Division of Marine Fisheries, and through outreach efforts that are being managed by Coastal Zone Management.

The Department of Environmental Protection had two water quality monitoring stations in this segment for the 1994 assessment. One was located at Cart Creek and one in the Parker River estuary at the Route 1 Bridge. The Massachusetts Division of Marine Fisheries Shellfish Program regularly tests the water in this segment for bacteria. The Parker River Clean Water Association has a monitoring station at the Newbury Docks as part of their volunteer monitoring program. Massachusetts Audubon Society had one monitoring station in this segment.

Recommendations: Support the efforts and projects of the Great Marsh teams. Additional work is needed to identify the sources of pollution in Cart Creek. While a public access for canoes and kayaks is available at the William Forward Wildlife Management Area on Route 1 in Newbury, there is interest for more and better access. Support the ongoing efforts to restore salt marsh throughout the subwatershed by eliminating tidal restrictions. Work with municipalities and land trusts to implement open space protection strategies. Promote outreach and education efforts directed towards boat waste management as well as the use of the pumpout facilities available in the estuary.

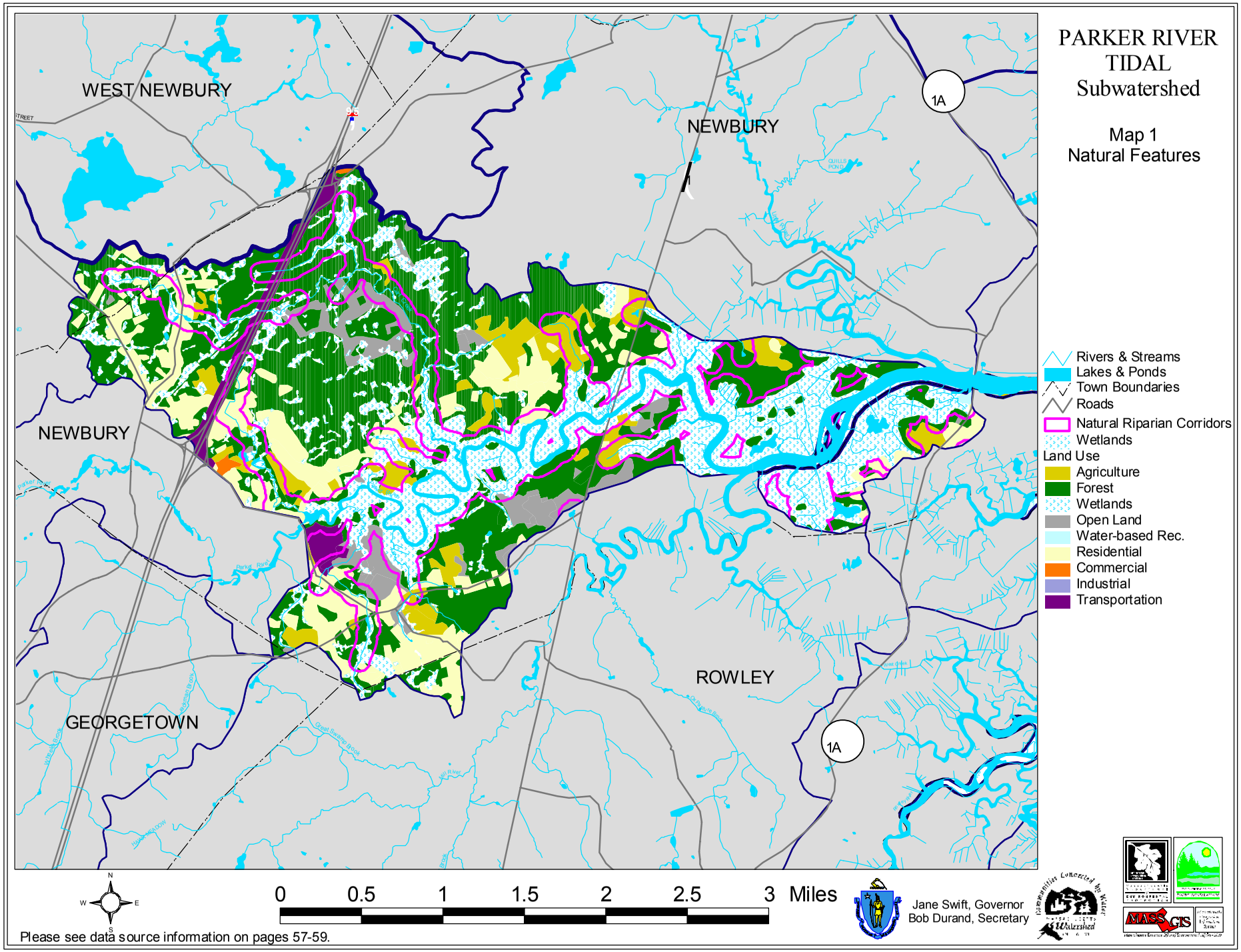

PARKER RIVER
TIDAL
Subwatershed
Map 1
Natural Features
WEST NEWBURY
NEWBURY
NEWBURY
ROWLEY
GEORGETOWN
1A
1A
Rivers & Streams
Lakes & Ponds
Town Boundaries
Roads
Natural Riparian Corridors
Wetlands
Land Use
Agriculture
Forest
Wetlands
Open Land
Water-based Rec.
Residential
Commercial
Industrial
Transportation
0 0.5 1 1.5 2 2.5 3 Miles
Jane Swift, Governor
Bob Durand, Secretary
Please see data source information on pages 57-59.

Figure 23

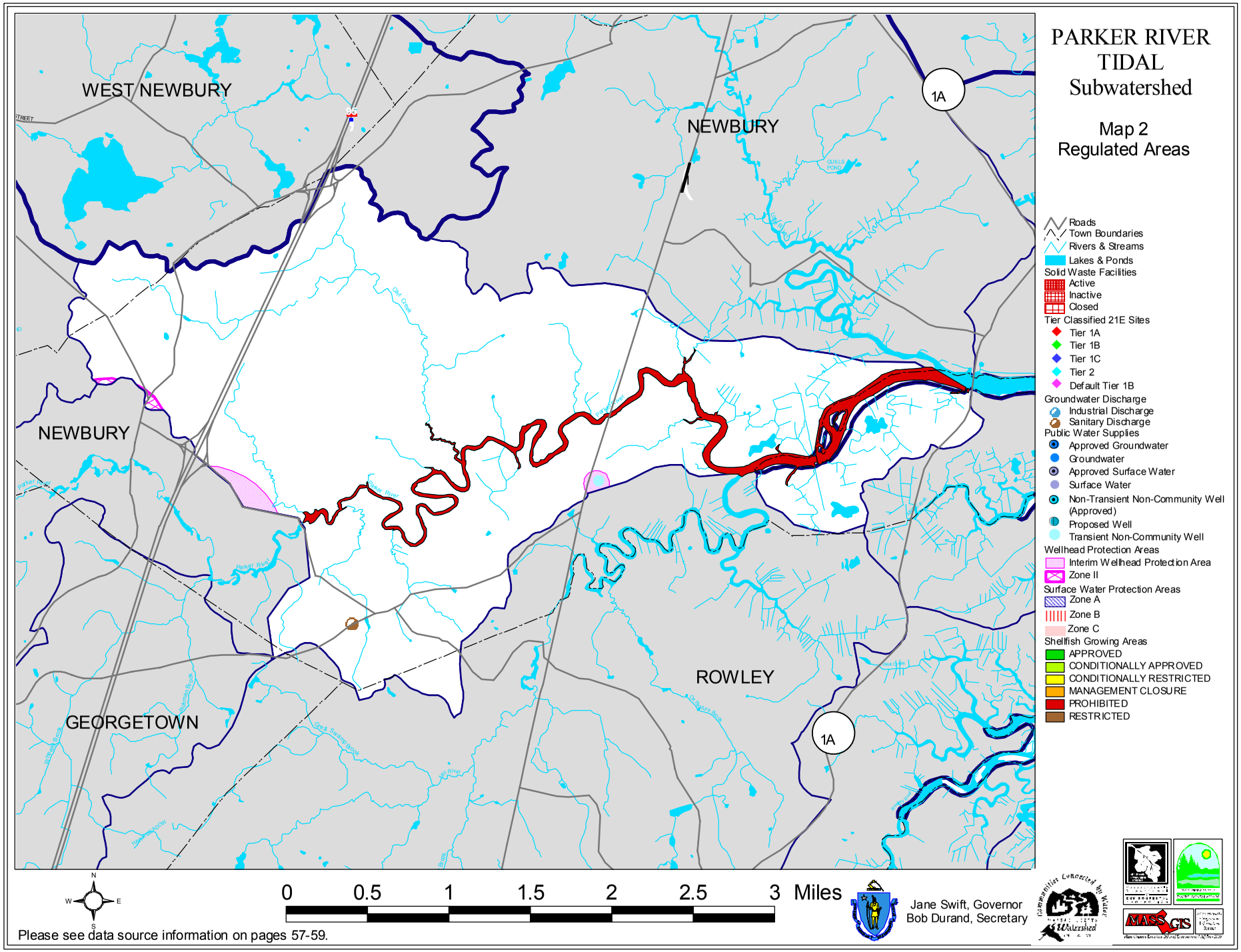


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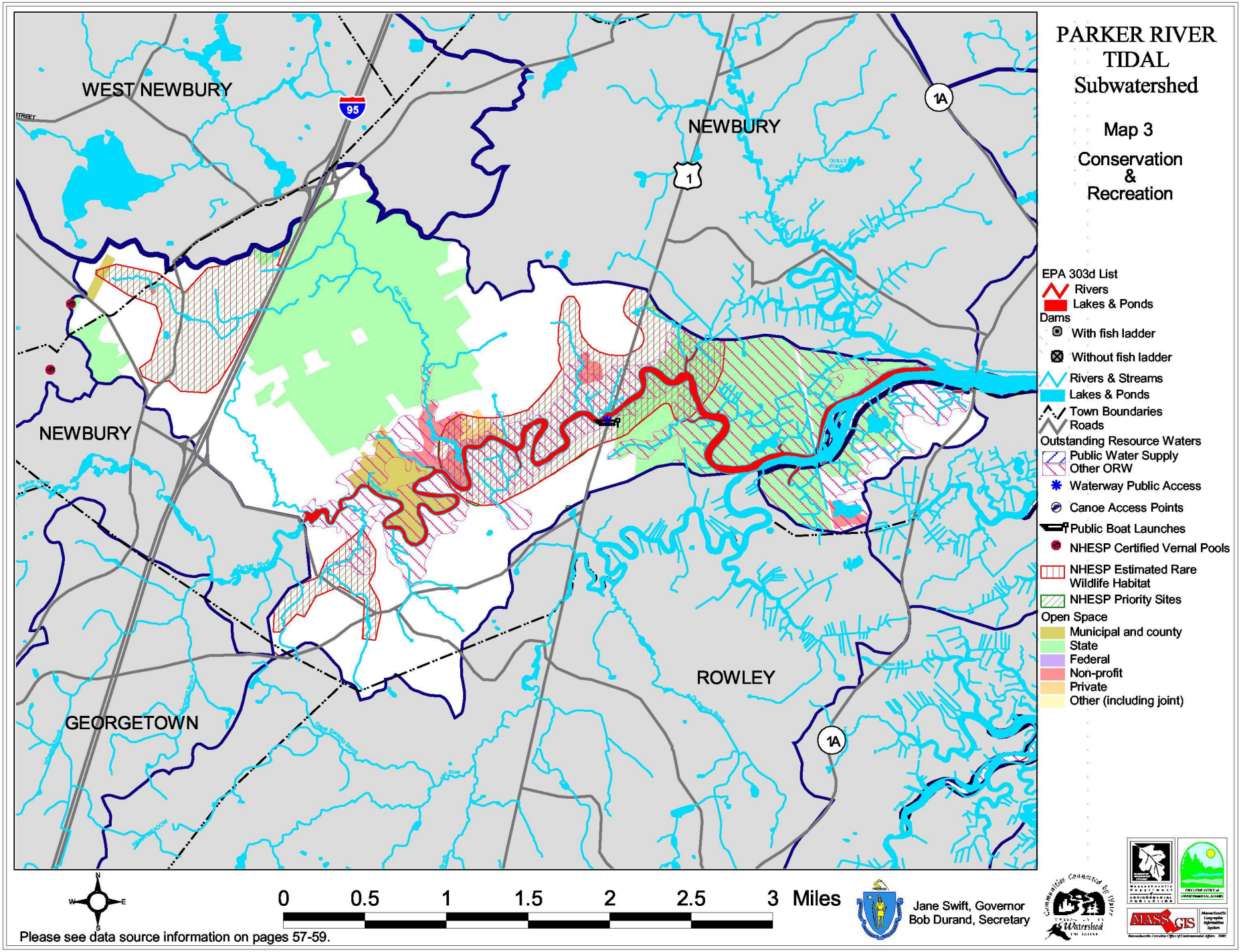
Figure 24



Please see data source information on pages 57-59.

Figure 25

Plum Island Sound Subwatershed Information

Municipalities: Newburyport, Newbury, Rowley and Ipswich

Estimated Population: 3941

General Description: This subwatershed is dominated and influenced by the salt marsh ecosystem, which comprises part of the Great Marsh. The Parker River/Essex Bay Area of Critical Environmental Concern is located here as is much of the 4662 acre Parker River National Wildlife Refuge. Largely undeveloped, this area is protected from coastal storms by the Plum Island barrier beach. Marinas and boat ramps provide access to Plum Island Sound for boating, sailing and fishing. Commercial and recreational shellfishing is a popular activity.

Land Area: 7596 Acres (12.0 Square Miles)

Land Use as of 1999: Undeveloped – 7119 acres (94% of the subwatershed, Wetlands are 61%)
Residential – 468 acres (6% of the subwatershed)
Commercial/Industrial – 9 acres (0.1% of the subwatershed)

Named Tributaries: Pine Island Creek, Little Pine Island Creek, Grape Island Creek, Eagle Hill River, Stacy Creek, Six Goose Creek, Paine Creek, Third Creek, Roger Island Creek, Laws Creek, Broad Creek, Metcalf Creek, Lords Creek, Mud Creek, Carolton Creek, Sawyer Creek.

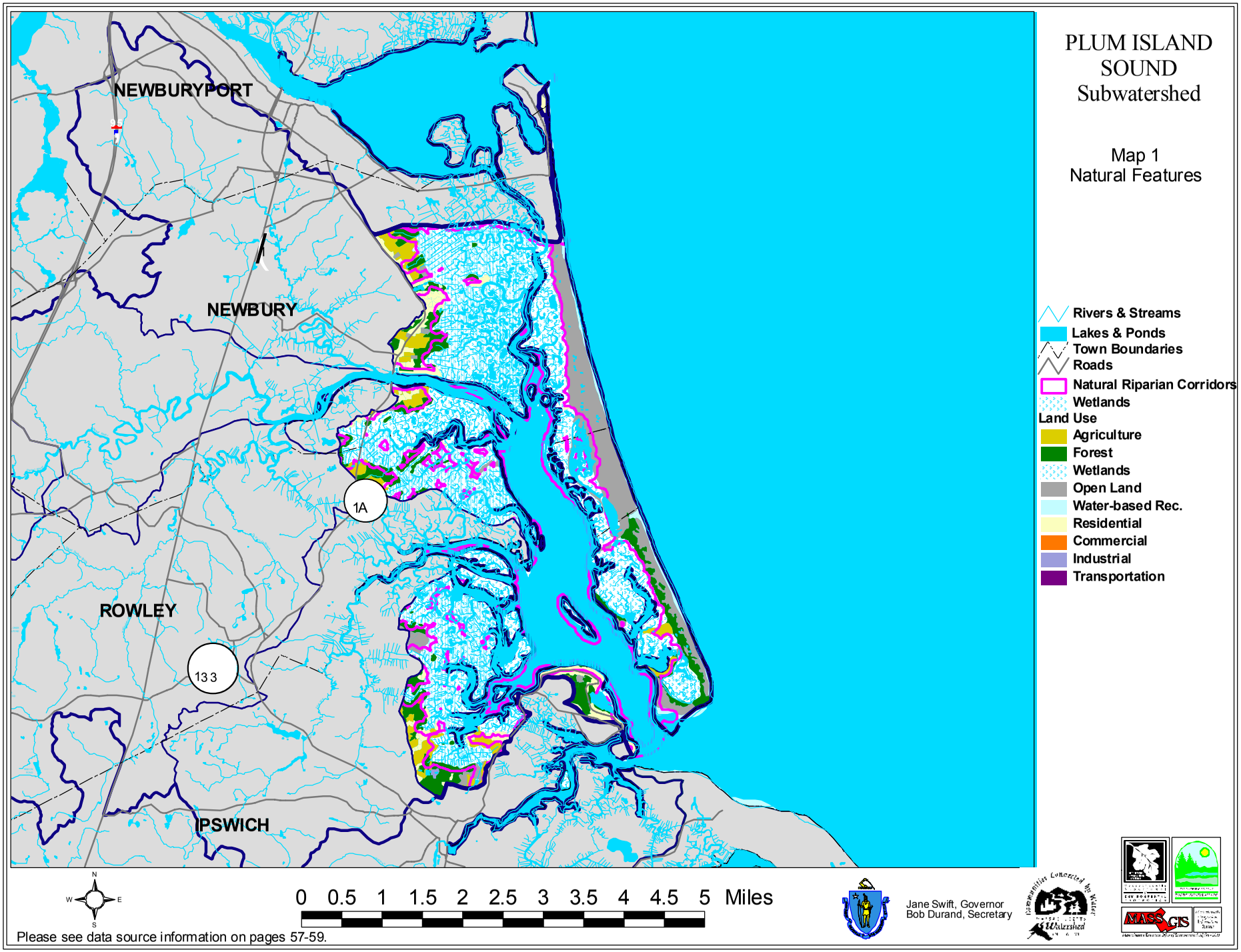
Lakes and Ponds: Clark Pond

Rapid Watershed Assessment: The proportion of impervious cover in this subwatershed is estimated to be about 4.5%. Based upon this, the water quality would be expected to be very high quality. While a comprehensive survey has not been done, one would expect to find excellent habitat, and diverse communities. However, some localized impacts from, road runoff, non-point source pollution and habitat alteration is likely. Impacts are expected with future growth, predicted by recently completed build-out analysis. The most sensitive resource in this subwatershed is the shellfish resources. Due to non-point source pollution from various sources the shellfish resources cannot be fully utilized and are subject to periodic closures. Some areas are classified as conditionally approved and some as prohibited from harvesting.

Water Quality Information: Due to the undeveloped nature of this subwatershed and the tidal exchange from the ocean, the water quality is generally very good, although water quality declines during wet weather due to non-point source pollution. The source of pathogens is suspected to be from waterfowl. Industrial and point sources of pollution come primarily from outside the subwatershed, although a potential source from within the watershed is the active landfill and composting facility located in Ipswich. These two sources should not pose a problem provided the pollution control best management systems are properly maintained. Active management and control of runoff from these sites well help to minimize this threat to water quality. Pathogens are generally higher in the upper reaches of Plum Island Sound, north of Mud Creek and in Plum Island River. Shellfish harvesting is “Conditionally Approved”.

Water quality monitoring has occurred through the efforts of a number of groups. The Massachusetts Division of Marine Fisheries Shellfish Program conducts regular water quality surveys, primarily for bacteria, throughout Plum Island Sound for managing the shellfish resource. Earlier work conducted by the Division of Marine Fisheries documented water quality and fishery habitat in the area. Others who have conducted water quality monitoring include the Massachusetts Department of Environmental Protection, the Massachusetts Audubon Society and the Marine Biological Laboratory Marine Ecosystem Research Center.

Recommendations: Support the efforts and projects of the Great Marsh teams. Support the ongoing efforts to restore salt marsh throughout the subwatershed by eliminating tidal restrictions. Work with municipalities and land trusts to implement open space protection strategies. Promote outreach and education efforts directed towards boat waste management. Work to identify the causes of degraded water quality during wet weather conditions.



Please see data source information on pages 57-59.

Figure 26

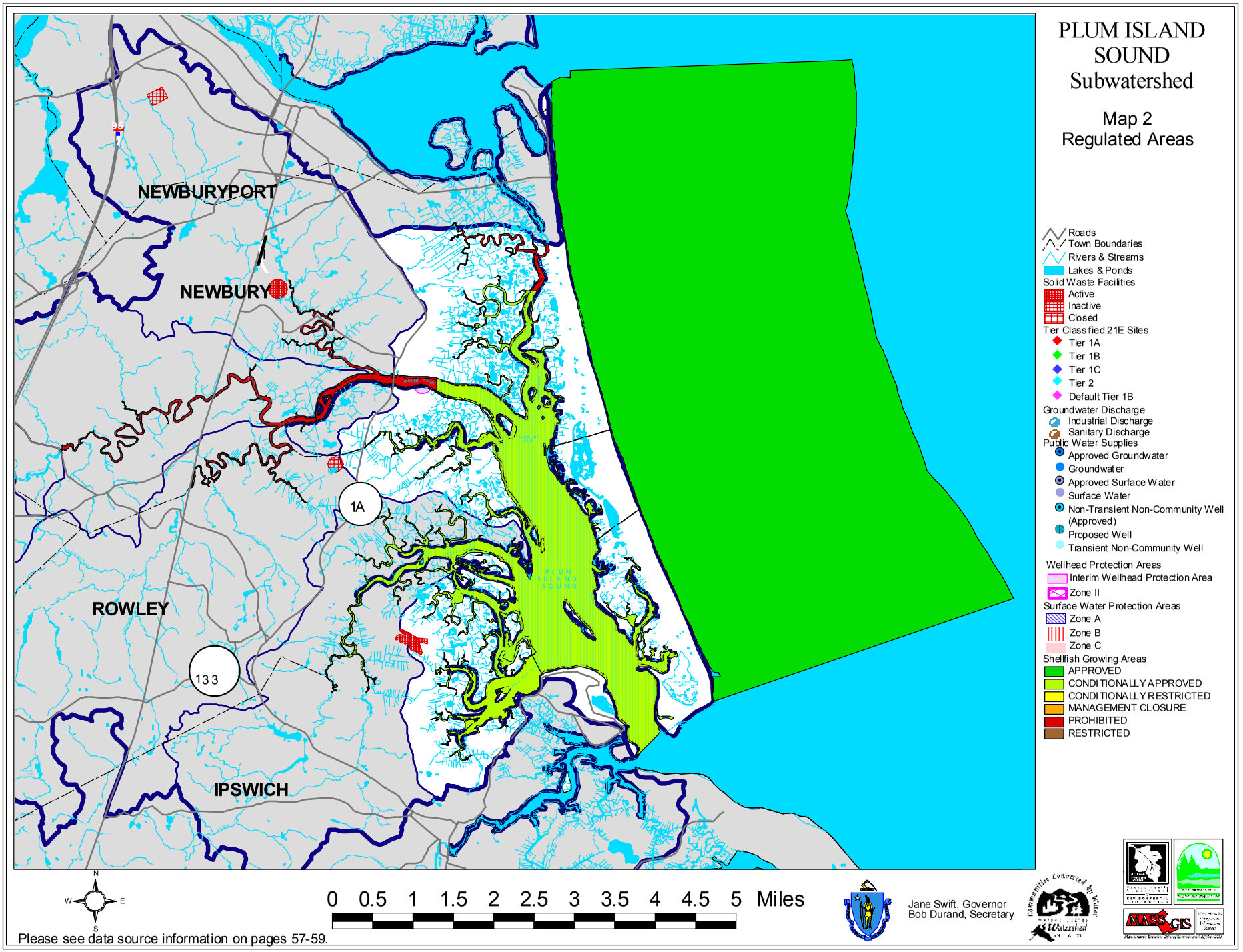


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Figure 27

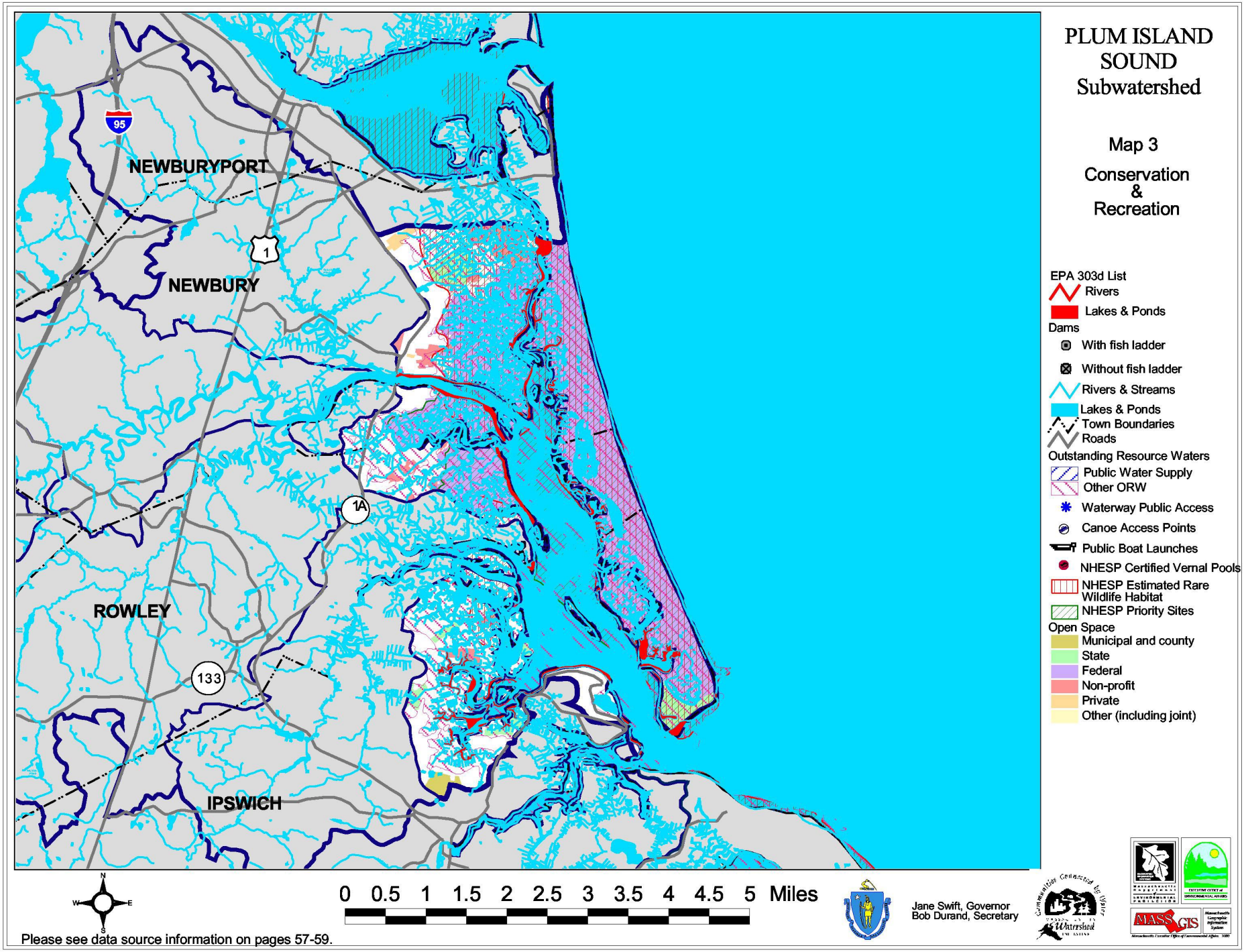
PLUM ISLAND SOUND Subwatershed
Map 3
Conservation & Recreation
NEWBURYPORT
NEWBURY
ROWLEY
IPSWICH
95
1
1A
133
EPA 303d List
Rivers
Lakes & Ponds
Dams
With fish ladder
Without fish ladder
Rivers & Streams
Lakes & Ponds
Town Boundaries
Roads
Outstanding Resource Waters
Public Water Supply
Other ORW
Waterway Public Access
Canoe Access Points
Public Boat Launches
NHESP Certified Vernal Pools
NHESP Estimated Rare Wildlife Habitat
NHESP Priority Sites
Open Space
Municipal and county
State
Federal
Non-profit
Private
Other (including joint)
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 Miles
Jane Swift, Governor
Bob Durand, Secretary
Please see data source information on pages 57-59.

Figure 28

GIS Data Source Information

1:25,000 Hydrography: From USGS 1:25,000 and 1:100000 Hydrography Digital Line Graphs. The DLG's were modified by adding features digitized from USGS 1:25,000 topographic quad sheets.

Towns: Digitized at MassGIS from stable based films prints of the USGS 1:25,000 scale quad sheets.

Mass. Highway Dept. Roads: Based on the 1:100000 USGS Digital Line Graphs with supplemental linework from MHD based on town-scale maps.

Land Use: Interpreted from 1:25,000 aerial photography taken in 1971, 1985 and in some areas 1990 or 1991/1992. Photo interpretation was done by the Resource Mapping Project at UMASS-Amherst. Updated information came from the Southeastern Regional Planning and Economic Development District (SPREDD), the Cape Cod Commission (CCC), the Executive Office of Transportation and Construction (EOTC), and the Massachusetts Water Resource Authority (MWRA).

Designated Shellfish Growing Areas: Defined by DFWELE-Dept. of Marine Fisheries biologists. Base maps were plotted at 1:12000 and MassGIS hydrography was used to locate boundaries. October 2000.

Outstanding Resource Waters: From MassGIS drainage subbasin and ACEC (Areas of Critical Environmental Concern) data layers. Additional water supply watershed information was delineated on USGS 1:25000-scale quad sheets.

NHESP Certified Vernal Pools: The certified vernal pool data is mapped on 1:24,000 or 1:25,000 USGS topographic quadrangle maps. The datalayer was created by the Natural Heritage & Endangered Species Program (NHESP) by generating a coverage from a database of latitude and longitude points, as those were read from the USGS quads. Shows pools certified as of June 30, 1999.

NHESP Priority Sites: This datalayer was digitized by NHESP. The information was compiled on paper topographic quadrangles at 1:25,000 scale and was digitized from that medium. Check plots were produced at 1:60,000; all habitats were checked for coding and locational accuracy.NHESP Estimated Rare Wildlife Habitat: This datalayer was digitized by NHESP. The information was compiled on and digitized from USGS 7.5 x 7.5 minute quadrangle, topographic maps at 1:25,000 and 1:24,000 scales. Polygons are checked for locational accuracy.

Solid Waste Facilities: The solid waste datalayer was originally digitized from USGS Quadrangle maps (1:25,000) filed as part of the operating permit (310 CMR 19.00) or siting (310 CMR 16.00) requirements for landfills.

Groundwater Discharge: Data was originally constructed from a Lotus Worksheet maintained by DEP/DWPC/GW. Collection of point locations began in 1989 and is ongoing. Points were first marked on USGS quadrangle sheets and then digitized.

Surface Water Protection Areas: Those areas that contribute to public surface water supplies were taken from the Drainage Sub Basins datalayer and overlaid with the 1:25,000 Hydrography datalayer to identify reservoirs and tributary streams. The reservoirs were extracted and buffered to produce Zone B's, reservoirs and tributaries were extracted and buffered to produce Zone A's, and sub basins were extracted to create Zone C's.

Canoe Access Points: The access points coverage was created using not only the AMC River Guide, but Nashua River Watershed Assoc. and Merrimack River Watershed Council guides as well. Access points were located by relating descriptions in the river guides to MassGIS road and river datalayers. In some cases, the organizations were called for clarification.

Open Space: Recompiled onto a standard 1:25,000 basemap produced by MassGIS then digitized. In other cases data may be digitized from a map supplied by a volunteer if this map meets minimum digitizing requirements. Increasingly, data are also pulled into the open space coverage from preexisting digital data layers provided by a municipality, regional planning agency, or state agency. NOTE ON APPROPRIATE USE OF DATA: These data are very useful for most statewide and regional planning purposes. However, they are not a legal record of ownership, and the user should understand that parcel representations are generally not based on property surveys.

Public Water Supplies: PWS sources were either compiled by DEP technical staff on stable mylar overlays based on USGS (1:25,000) topographic quadrangle maps or directly onto one of the following GIS generated manuscript maps: MassGIS vector data-based map, MassGIS USGS topographic image-based map, or MassGIS Black and White orthophoto image-based map.

Wellhead Protection Areas: Zone II delineation maps, based on USGS (1:25,000) topographic quadrangles, are submitted to the DEP DWP as a requirement for Zone II approval and are considered to be the Department's "official" Zone II maps. Since 1999, Zone II data developed under DEP's Source Water Assessment Program (SWAP) is submitted by the consultant in a digital (ESRI shapefile) format.

Interim Wellhead Protection Area (IWPA): Simple polygon coverages generated with the Arc/INFO buffer command, based on PWS well point locations in the DEP Public Water Supply datalayer. DEP GIS-based IWPA buffer radius values are determined from the best available digital pumping rate information, as provided to the GIS Program from DWP.

Public Access Board Sites: From the Mass. Dept. of Fisheries and Wildlife (DFWELE). Source information from a guide entitled Public Access to the Waters of Massachusetts published by the Public Access Board of DFWELE. Additional info from 1:25,000 USGS quads.

ACECs: Areas of Critical Environmental Concern are compiled from 1:25,000 USGS quad sheets, 1:5000 orthophotos, or other MassGIS datalayers and digitized.

Major Watersheds: Produced by the USGS Water Resources Division. Reclassified into major watersheds by the Massachusetts Water Resources Commission.

Major Ponds: From USGS 1:100,000 Digital Line Graphs.

Natural Riparian Corridors: Natural lands within a 100-meter corridor encompassing perennial stream and river features (as coded in the MassGIS 1:25,000 Hydrography layer).

Contiguous Natural Lands: Contiguous lands were defined using selected roads and a "natural land" definition tailored to meet the objectives of the Massachusetts Resource Identification Project (MRIP).

Wetlands: Massachusetts Department of Environmental Protection, 1:5,000. Interpreted at UMASS from 1:12,000 color-infrared photographs that were taken between 1990 and 1999. Wetlands and streams overlayed and quality checked on 1:5,000 orthophotos by the Wetlands Conservancy. February, 20001.

Tier Classified 21E Sites: 1:25,000. Chapter 21E site files maintained by the DEP contain a variety of types and qualities of maps, including surveys, site plans and locus maps. DEP GIS Program staff reviewed this file information and identified the best manuscript maps and supplemental text information for locating sites. In limited cases, textual manuscripts, contained in the site files, provided sufficient descriptive information for estimating site locations.
Data Disclaimer: Point locations representing Tier Classified Chapter 21E sites in this datalayer have not been field-verified and should be considered approximate. Locations were derived through review and interpretation of paper maps and textual information contained in DEP BWSC site files, which are maintained in DEP's Regional Offices. Generally, such information was submitted to DEP by potentially responsible parties (PRPs) and the PRPs' licensed site professionals (LSPs). Please be advised that this datalayer is incomplete. The DEP has been unable to locate some sites due to inadequate source material. Sites that are not yet reported or tier-classified are not mapped, nor are sites for which a Response Action Outcome (RAO) has been submitted to the DEP. Site contamination may extend well away from the point representing a site on this map. The DEP BWSC site files should be reviewed for the most accurate and up-to-date information about a particular site. While the Tier Classified Chapter 21E site data shown on this map provides some useful information, the user should be aware of the data's limitations. For further information, please consult the datalayer description documentation of DEP Tier Classified Oil or Hazardous Material Sites available on the MassGIS Web Site: http://www.state.ma.us/mgis/c21e.htm. Questions regarding Tier Classified Chapter 21E site data on this map should be referred to the DEP GIS Program (617) 574-6856. General and technical questions regarding Chapter 21E, the MCP and waste site cleanup in Massachusetts should be directed to the DEP BWSC (617) 338-2255 or (800) 426-0444.

EPA 303d List: Waterbodies designated by the Department of Environmental Protection as not meeting the state's surface water quality standards as included in the "Massachusetts Section 303(d) List of Waters, 1998".

Dams: From the Department of Environmental Management Office of Dam Safety.

Great Marsh Focus Area: From the Department of Environmental Management and as identified by the Executive Office of Environmental Affairs.

Appendices

Appendix A - Status of 21e Sites Parker River Watershed

Appendix B - NPDES Permits Parker River Watershed

Appendix C - Bibliography

Appendix A: Status of 21E Sites

Parker River Watershed

Release Tracking Number (RTN)	***City/Town***	***Release Address***	***Site Name/*** Location Aid	Compliance Status	***Date***	***Phase***	***Chemical Type***
3-0001455	BOXFORD	561 Main St.	Village Country Store	NFA	8/12/1994	I	----
3-0003517	BOXFORD	200 Washington St.	Property	RAO	7/18/1997	No Phase	Oil
3-0010394	BOXFORD	15 Spofford Rd.	Boxford Landfill	RAO	12/31/1996	No Phase	Oil
3-0020047	BOXFORD	27C Bayns Hill Rd.	New Residential Construction	RAO	12/20/2000	No Phase	Oil
3-0000320	GEORGETOWN	201 Central St.	Coronet Leather Finishing	RAO	2/9/1999	I	Hazardous Material
3-0001503	GEORGETOWN	Moulton St.	Automatic Connector Inc (FMR)	TIER 1B Active	9/13/1994	III	Hazardous Material
3-0002384	GEORGETOWN	43-51 West St.	Tidds Used Auto Parts	NDS	4/27/1996	No Phase	Oil
3-0002574	GEORGETOWN	67 West Main St.	Richdale Dairy Store	TIER 2 Active	2/19/1997	II	Oil
3-0004113	GEORGETOWN	73 East Main St.	Getty Service Station #30605	RAO	5/1/98	II	Oil
3-0004198	GEORGETOWN	75 West Main St.	Townsend Oil Co.	TIER 2 Active	5/18/1995	I	Oil
3-0004256	GEORGETOWN	West Main & Central St.	Mobil Service Station #01-248	RAO	12/15/1995	II	Oil
3-0004277	GEORGETOWN	42 Central St.	G&C Cleaners	TIER 2 Active	2/3/1998	II	Hazardous Material
3-0004510	GEORGETOWN	70 Tenney St.	Neptune Demolition	NFA	8/7/1997	No Phase	Hazardous Material
3-0011457	GEORGETOWN	2 Winter St.	No Location Aid	RAO	8/11/1997	II	Oil
3-0012181	GEORGETOWN	73 East Main St.	Getty #30605	RAO	5/1/1998	II	Oil

3-0012231	GEORGETOWN	75 West Main St.	No Location Aid	RAO	5/3/1995	No Phase	Oil
3-0012766	GEORGETOWN	15 Winter St.	Georgetown High School	RAO	9/25/1995	No Phase	Oil & Hazardous Material
3-0013634	GEORGETOWN	Rte 95N	1 Mile North of Exit 54	RAO	6/3/1996	No Phase	Oil
3-0014388	GEORGETOWN	201 Central St.	Coronet Leather	RAO	2/9/1999	No Phase	Oil
3-0016825	GEORGETOWN	Rte 133 @ Rte 95S	No Location Aid	RAO	6/30/1998	No Phase	Oil
3-0017878	GEORGETOWN	172-174 West Main St.	No Location Aid	TIER 2 Active	1/21/2000	II	Oil
3-0017957	GEORGETOWN	75 West Main St.	No Location Aid	RAO	4/1/1999	No Phase	Oil
3-0018179	GEORGETOWN	43 to 51 West St.	Tidd Used Auto Parts Inc.	Tier 1C Active	4/14/2000	II	Oil & Hazardous Material
3-0019431	GEORGETOWN	Rte 95N @ Exit 54B	No Location Aid	RAO	5/1/2000	No Phase	Oil
3-0020069	GEORGETOWN	80 Andover St.	Opp Lake Shore Dr.	RAO	1/3/2001	No Phase	Oil
3-0020101	GEORGETOWN	67 West Main St.	Prospect St.	Preclassified	11/1/2000	No Phase	Hazardous Material
3-0020157	GEORGETOWN	100 West St.	Pine Plain Rd.	Preclassified	11/28/2000	No Phase	Oil
3-0012143	GROVELAND	192 Seven Star Rd.	No Location Aid	RAO	6/12/1995	No Phase	Oil
3-0001103	IPSWICH	Mitchell Rd.	Yellow Glow Banana	RAO	8/5/1996	No Phase	Oil
3-002101	IPSWICH	76 Paradise Rd.	Property	RAO	10/22/1997	I	Oil
3-0002554	IPSWICH	206 High St.	Riverside Foreign Auto	DEF TIER 1B Active	8/2/1996	No Phase	Oil

3-0002579	IPSWICH	119-125 High St.	Arwood Machine Corp.	NFA	8/3/1990	II	Oil
3-0013495	IPSWICH	326 High St.	Route 1A and 133 White Farm	RAO	3/6/1997	No Phase	Oil & Hazardous Material
3-0014987	IPSWICH	176 High St.	Paul's Towing Service	RAO	9/29/1997	No Phase	Oil & Hazardous Material
3-0015078	IPSWICH	Mitchell Rd.	Yellow Golden Banana Co.	RAO	2/3/1998	No Phase	Oil
3-0003197	NEWBURY	196 Scotland Rd.	Property	RAO	5/30/2000	II	Hazardous Material
3-0010321	NEWBURY	3 Newburyport Turnpike	Rt1North Newbury/ NEWBURYPORT TOWNLINE	TIER 1B Active	9/26/1995	II	Hazardous Material
3-0010391	NEWBURY	28 Main St.	Byfield/Newbury	RAO	10/24/1994	No Phase	Oil
3-0013426	NEWBURY	200 Scotland Rd.	Facility No. 73	RAO	2/10/1997	No Phase	Oil
3-0014275	NEWBURY	52 Main St.	Byfield	DEF TIER 1B Active	10/3/1997	No Phase	Oil
3-0016525	NEWBURY	90 Hanover St.	East Coast S&G	RAO	2/26/1999	No Phase	Oil
3-0016729	NEWBURY	Newman Rd.	No Location Aid	RAO	7/22/1998	No Phase	Oil
3-0016731	NEWBURY	Route 1	No Location Aid	DEF TIER 1B Active	5/5/1999	No Phase	Oil
3-0018712	NEWBURY	I95 MM 55	No Location Aid	RAO	11/5/1999	No Phase	Oil
3-0019388	NEWBURY	292 High Rd.	No Location Aid	RAO	7/3/2000	No Phase	Oil
3-0020046	NEWBURY	96-98 Newburyport Turnpike	No Location Aid	Preclassified	10/20/2000	No Phase	Hazardous Material
3-0020235	NEWBURY	Green St.	No Location Aid	RAO	2/16/2001	No Phase	Hazardous Material

3-0000392	NEWBURYPORT	Route 1 Traffic Circle	Circle Finishing	Tier 1B Active	12/13/1995	II	Hazardous Material
3-0000393	NEWBURYPORT	7 Muliken Way	Strem Chemical	NFA	7/23/1993	No Phase	Hazardous Material
3-0001690	NEWBURYPORT	5 Greenleaf &/or 2-4 Fulton St.	M&V Electroplating Corp	TIER 2 Active	10/8/1999	II	Hazardous Material
3-0001691	NEWBURYPORT	Hale St.	Property	NDS	7/16/1996	No Phase	----
3-0001857	NEWBURYPORT	122 Parker St.	Property	NFA	8/3/1995	I	Oil & Hazardous Material
3-0002074	NEWBURYPORT	116 Parker St.	Berkshire MFG Products Inc.	NFA	11/7/1994	II	Hazardous Material
3-0002417	NEWBURYPORT	12 Parker St.	Amcare	DEF TIER 1B Active	8/2/1996	No Phase	Oil
3-0003360	NEWBURYPORT	76 Storey Ave.	Mobil Service Station #01-296	TIER 2 Active	11/13/2000	IV	Oil
3-0004312	NEWBURYPORT	75 Storey Ave.	Shell Gasoline Station	RAO	2/1/2000	II	Oil
3-0004589	NEWBURYPORT	13 Malcom Hoyte Dr.	Hero Coatings Inc	RAO	8/5/1997	No Phase	Hazardous Material
3-0011872	NEWBURYPORT	22 Graf Rd.	Brush Wellman Co.	RAO	11/19/1997	IV	Hazardous Material
3-0012316	NEWBURYPORT	11 Malcolm Hoyt Dr.	No Location Aid	RAO	10/11/1995	No Phase	Oil
3-0012652	NEWBURYPORT	3 Perkins Way	Plastek Corp.	RAO	8/17/2000	V	Hazardous Material
3-0012659	NEWBURYPORT	Low St.	National Guard Armory	RAO	5/4/1999	II	Oil
3-0013757	NEWBURYPORT	Rte. 1	At Parker St.	RAO	5/13/1996	No Phase	Hazardous Material
3-0014479	NEWBURYPORT	57 Low St.	No Location Aid	RAO	5/4/1999	II	Hazardous Material

3-0017530	NEWBURYPORT	6 Mulliken Way	No Location Aid	RAO	12/14/1998	No Phase	Oil
3-0018196	NEWBURYPORT	2 Carey Ave.	No Location Aid	RAO	4/14/1999	No Phase	Hazardous Material
3-0018548	NEWBURYPORT	Low & Storey St.s	No Location Aid	RAO	11/18/1999	No Phase	Oil
3-0018570	NEWBURYPORT	9 Malcolm Hoyt Dr.	No Location Aid	TIER 2 Active	8/2/2000	II	Hazardous Material
3-0018644	NEWBURYPORT	122 Parker St.	No Location Aid	RAO	10/21/1999	No Phase	Hazardous Material
3-0019779	NEWBURYPORT	75 Storey Ave.	Low St.	Preclassified	7/29/2000	No Phase	Oil
3-0020105	NEWBURYPORT	7 Opportunity Way	No Location Aid	RAO	11/9/2000	No Phase	Hazardous Material
3-0016951	WEST NEWBURY	70 Maple St.	No Location Aid	RAO	9/3/1998	No Phase	Oil
3-0018467	WEST NEWBURY	Crane Neck St. at Power Lines	Intersection with Georgetown Rd.	RAO	8/30/1999	No Phase	Oil
3-0015859	NORTH ANDOVER	1430 Great Pond Rd.	Property	RAO	12/19/2000	No Phase	Oil
3-0000169	ROWLEY	408 Haverhill St.	Omega Laboratories	RAO	3/26/1996	II	Hazardous Material
3-0000860	ROWLEY	Newburyport Turnpike (Rte 1)	Transene Co/Rowley Biochem	RAO	12/21/1998	II	Hazardous Material
3-0000946	ROWLEY	7 Kittery Ave.	Maine Post & Bean	DEF TIER 1B Active	3/31/1995	No Phase	Hazardous Material
3-0001176	ROWLEY	Newburyport Turnpike (Rte 1)	MHD Maintenance Depot	TIER 1C Active	4/22/1996	III	Hazardous Material
3-0001860	ROWLEY	103 Boxford Rd.	Laidlaw	RAO	4/26/1996	I	Oil
3-00001897	ROWLEY	164 Boxford Rd.	Rowley Auto Parts	NFA	8/9/1995	I	Oil

3-0003040	ROWLEY	116 Haverhill St.	Elano East Corporation	Pending NFA	12/21/1993	I	Oil & Hazardous Material
3-0003412	ROWLEY	Main & Haverhill St.	Knowles Mobil	DEF TIER 1B Active	8/2/1996	I	Oil
3-0003484	ROWLEY	110 Boxford Rd.	Laidlaw Waste Systems	TIER 1C Active	12/26/1996	II	Oil
3-0004079	ROWLEY	Haverhill St.	Property-Parcels 9-5,-6-,7,-8	NDS	6/10/1996	No Phase	----
3-0010203	ROWLEY	Rt. 1	Rowley DPW Depot	RAO	6/12/1995	No Phase	Oil
3-0010225	ROWLEY	125 Main St.	Richdale Convenience Store/Town Common	RAO	11/23/1994	No Phase	Oil
3-0011582	ROWLEY	110 Boxford Rd.	Laidlaw	RAO	9/18/1995	No Phase	Oil
3-0012290	ROWLEY	Main St.	Pine Grove School	RAO	8/12/1997	III	Oil
3-0013068	ROWLEY	40 Independent St.	No Location Aid	RAO	10/25/1996	No Phase	Oil
3-0013146	ROWLEY	500 Weathersfield	No Location Aid	RAO	1/9/1996	No Phase	Oil
3-0013650	ROWLEY	261 Newburyport Turnpike	MHD Facility No. 78	RTN Closed	10/17/1997	No Phase	Oil & Hazardous Material
3-0014705	ROWLEY	235 Dodge Rd.	No Location Aid	RAO	1/23/1997	No Phase	Oil
3-0015939	ROWLEY	420 Newburyport Turnpike	Rte 1	RAO	1/22/1998	No Phase	Oil
3-0015967	ROWLEY	48 West Ox Pasture Ln	Lot 2	RAO	3/18/1997	No Phase	Oil
3-0016922	ROWLEY	165 Newburyport Turnpike Rte 1N	Rte 133	TIER 1C Active	5/20/1999	II	Hazardous Material
3-0017699	ROWLEY	165 Newburyport Turnpike	Rte 133	TIER 1C Active	5/20/1999	II	Oil

3-0019175	ROWLEY	Newburyport Turnpike Rte 1	Half mile north of Rte 133	RAO	1/16/2001	No Phase	Hazardous Material
3-0019847	ROWLEY	165 Newburyport Turnpike	No Location Aid	Preclassified	8/17/2000	No Phase	Hazardous Material
3-0020142	ROWLEY	272 Weathersfield Rd.	No Location Aid	Preclassified	11/20/2000	No Phase	Oil

Definitions

Release Tracking Number (RTN):
The number assigned to every site /reportable release. This number is preceded by 1, 2, 3, or 4 depending on the region where the release/site is located (e.g., 3-0001234). An RTN beginning with the number 3 represents the Northeast Region.

Compliance Status:
21E sites compliance status definitions:
ADREG (Adequately Regulated): A site/release where response actions are deemed adequately regulated under another DEP program or by another government agency.
DPS (Downgradient Property Status): A site where a DPS Submittal to DEP has stated that contamination on the property is coming from an upgradient property.
PRECLASSIFIED: A release that has not reached its Tier Classification deadline (usually one year after it was reported), and where an RAO Statement, DPS Submittal, or Tier Classification Submittal has not been received by DEP.
RAO (Response Action Outcome): A site/release where an RAO Statement was submitted. An RAO Statement asserts that response actions were sufficient to achieve a level of no significant risk or at least ensure that all substantial hazards were eliminated.
RTN Closed: Future response actions addressing the release associated with this Release Tracking Number (RTN) will be conducted as part of the response actions planned for the site under another "primary" RTN.
TCLASS (Tier Classification): A site/release where a Tier Classification Submittal was received, but the classification type has not been confirmed by DEP.
Note: Sites are usually Tier Classified using the Numerical Ranking System (NRS). The NRS scores sites on a point system based on a variety of factors. These include the site's complexity, the type of contamination, and the potential for human or environmental exposure to the contamination. In addition, some sites are automatically classified as Tier 1 sites if they pose an imminent hazard, affect public water supplies, or miss regulatory deadlines.
TIER 1A: A site/release receiving a total NRS score equal to or greater than 550. These sites/releases require a permit and the person undertaking response actions must do so under direct DEP supervision.
TIER 1B: A site/release receiving an NRS score of less than 550 and equal to or greater than 450. These sites/releases also require a permit, but response actions may be performed under the supervision of a Licensed Site Professional (LSP) without prior DEP approval.
TIER 1C: A site/release receiving a total NRS score of less than 450 and equal to or greater than 350. A site/release receiving a total NRS score of less than 350, but which meets any of the Tier 1 Inclusionary Criteria specified in 310 CMR 40.0520(2)(a), is also classified a Tier 1C. These sites/releases also require a permit, but response actions may be performed under the supervision of an LSP without prior DEP approval.
TIER 2: A SITE/RELEASE RECEIVING A TOTAL NRS SCORE OF LESS THAN 350, UNLESS THE SITE meets any of the Tier 1 Inclusionary Criteria (see above). Permits are not required at Tier 2 sites/releases and response actions may be performed under the supervision of an LSP without prior DEP approval. ALL PRE-1993 TRANSITION SITES THAT HAVE ACCEPTED WAIVERS ARE CATEGORICALLY TIER 2 SITES.
DEF TIER 1B (Default Tier 1B): A site/release where the responsible party fails to provide a required submittal to DEP by a specified deadline.

The following definitions apply to sites that were reported to DEP prior to October 1993 which were regulated under an older version of the MCP:
NFA: (No Further Action): NFA means that response actions were conducted and DEP determined that no further action was needed for the site.
NDS: (Not a Disposal Site): NDS means that DEP has determined that these locations did not need to be reported and are not disposal sites.
PENDING: Pending means that DEP is waiting for a required action to be fulfilled.
PENDING NFA: Pending No Further Action means a document was submitted to DEP asserting that a site assessment has determined that no further action is required. These submittals are considered pending until DEP audits them.
Compliance Status Date: The date a release/site was listed as its current compliance status.

Phase:
Indicates the release/site cleanup phase.
No Phase: Phase report not required or not submitted.
Phase I: Initial Site Investigation, including Tier Classification. In this phase, samples are collected and analyzed to determine the types, amounts, and location of contaminants.
Phase II: Comprehensive Site Assessment. During Phase II, the risks posed to public health, welfare, and the environment are determined.
Phase III: Identification, Evaluation, and Selection of Comprehensive Remedial Action Alternatives and the Remedial Action Plan. In Phase III, cleanup options are assessed and a cleanup plan is selected.
Phase IV: Implementation of the Selected Remedial Action Alternative and Remedy Implementation Plan. The cleanup plan is implemented in Phase IV.
Phase V: Operation, Maintenance, and/or Monitoring. During Phase V, long-term treatment processes are implemented and monitored to track cleanup progress.

Source:
Department of Environmental Protection Bureau of Waste Site Cleanup
www.state.ma.us/dep/bwsc/sites/report.htm

Appendix B: NPDES Sites

Parker River Watershed

Permitee	NPDES #	Type
Getty Service Station, Georgetown	MA0035548	Minor (Closed/Inactive)
Georgetown Water Treatment Facility, Georgetown	MAG640024	General Permit
Ipswich Water Treatment Facility, Ipswich	MAG640024	General Permit
Governor Dummer Academy, Newbury	MA0030350	Minor Sanitary Wastewater
JRM Hauling and Recycling, Newbury	MAR05B873	Multi-Sector Stormwater
JRM Hauling and Recycling, Newbury	MAR05B735	Multi-Sector Stormwater
Newburyport Layover, MBTA, Newbury	MAR05C013	Multi-Sector Stormwater
Bixby International, Newburyport	MAR05C053	Multi-Sector Stormwater
Bixby International, Newburyport	MAR05C035	Multi-Sector Stormwater
Borregaard Synthesis, Inc. Newburyport	MAR05B262	Multi-Sector Stormwater
GI Plastek Ltd. Ptrn., Newburyport	MAR05B658	Multi-Sector Stormwater
Hero Coatings, Newburyport	MAR05B077	Multi-Sector Stormwater
Owens-Brockway Plastics, Newburyport	MAR05C086	Multi-Sector Stormwater

Note: this list is subject to change as additional facilities receive Multi-Sector Stormwater permits

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